Stantec

Stantec Consulting Services Inc.
1500 Lake Shore Drive Suite 100, Columbus OH 43204-3800

December 19, 2018

Attention: Lorena Locke
Bureau of Environmental Epidemiology
Missouri Department of Health and Senior Services
P.O. Box 570
Jefferson City, MO 65102

Dear Lorena Locke,

Reference: Health Consultation, PUBLIC COMMENT VERSION: Evaluation of Exposure to Landfill Gases in Ambient Air, BRIDGETON SAINTARY LANDFILL, BRIDGETON, ST. LOUIS COUNTY, MISSOURI, September 21, 2018

On behalf of Bridgeton Landfill, LLC, Stantec Consulting Services, Inc. (Stantec) reviewed the above referenced Health Consultation and has prepared the comments transmitted with this letter.

We appreciate the opportunity to submit our comments into the public record.

Regards,

Stantec Consulting Services Inc.

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Attachment: Bridgeton Landfill, LLC Comments on MDHSS Health Consultation

c. Erin Fanning, Bridgeton Landfill, LLC
Jessie Merrigan, Lathrop & Gage
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December 19, 2018

Bridgeton Landfill, LLC Comments

Missouri Department of Health and Senior Services, Health Consultation Report

Evaluation of Exposure to Landfill Gases in Ambient Air; Bridgeton Sanitary Landfill Bridgeton, St. Louis County, Missouri

The Missouri Department of Health and Senior Services (MDHSS) prepared a Health Consultation Report titled "*Evaluation of Exposure to Landfill Gases in Ambient Air; Bridgeton Sanitary Landfill Bridgeton, St. Louis County, Missouri*" on September 21, 2018 and distributed the report for public comment. Stantec Consulting Services Inc., (Stantec) on behalf of the Bridgeton Landfill, LLC, (Bridgeton) has prepared the following comments in response to the MDHSS Report.

Comment Summary

Conclusions 1, 2 and part of 3 are overstated. Ambient air around Bridgeton Landfill did not in the past pose unacceptable risk of adverse health effects to people working and living nearby. Conclusions 4, 5 and the remainder of 3 are accurate.

MDHSS asserts in "Conclusion 1" that "In the past, breathing sulfur-based compounds [i.e., reduced sulfur compounds (RSCs) and sulfur dioxide (SO_2)] at concentrations detected in ambient air near the landfill may have harmed the health of people living or working near the landfill by aggravating chronic respiratory disease." This conclusion over-extends data from MDNR's AreaRAE® monitoring and ignores laboratory analytical data which prove that even in 2013, ambient concentrations of sulfur-based compounds were below screening levels for protection of human health.

The MDHSS conclusion is based primarily on the hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) readings by AreaRAE® sensors. AreaRAE® sensors are designed for industrial environments where there is potential for exposure to acutely hazardous concentrations of these compounds. The sensors are not designed and should not be used to quantify low concentrations of H_2S or SO_2 in ambient air.

The Agency for Toxic Substances and Disease Registry (ATSDR) Acute Minimal Risk Level (MRL) is an estimate of the amount of a chemical a person can eat, drink, or breathe each day without a detectable risk to health; if someone is exposed to an amount above the MRLs, it does not mean that health problems will happen.

Properly using this data for screening requires looking at the data over time as MRLs are derived for specified periods of exposure. For example, the Acute MRL is derived for exposure lasting 1 – 14 days, the Intermediate MRL is protective for exposures lasting 15 to 364 days. Discrete one-minute interval detections by AreaRAE® sensors do not represent continuous exposure over longer periods of time and do not show conditions of exposure where health effects have been observed in people. MDHSS points to limited and infrequent detections above screening levels, but most of the data are well below screening levels. Many of the hourly maximum concentrations of H_2S and SO_2 called out by MDHSS are a single one-minute measurement out of 60 minutes, sometimes the balance of the 60 minutes had no measurable concentrations.

More accurate data from MDNR shows that ambient air around the landfill did not pose unacceptable risk. From April through August 2013, MDNR collected weekly air samples using SUMMA™ canisters and analyzed these samples using ASTM Method D-5504 to measure reduced sulfur compounds in ambient air. This laboratory method quantifies concentrations of reduced sulfur compounds far below the detection limit of the AreaRAE® and well below protective screening levels. MDNR ended this sampling when the highly-impermeable Ethylene Vinyl Alcohol (EVOH) landfill cover was completed in in September 2013, *"because aldehydes and sulfur-based compounds had not been detected in ambient air samples at concentrations of concern."*

MDHSS also omitted results from MDNR sampling in 2012, early 2013, and May of 2013. Data from each of those MDNR-approved sampling events showed that levels of sulfur-based compounds on the landfill were within acceptable levels and did not present a health risk. Reports of the results of ambient air sampling conducted by Bridgeton under mandate by MDNR, and by MDNR are publicly available on-line. Titles of the air sampling reports produced by Stantec Consulting Services, Inc. on behalf of Bridgeton Landfill are listed in the References to our comments. Summary tables of Laboratory Analytical Results for Comprehensive Air Sampling Events (2012-2015) from the MDNR-approved sampling events conducted by Bridgeton Landfill are provided in Attachment A to our comments.

A recent study by the St. Louis County Department of Public Health and the St. Louis University College for Public Health published in a peer reviewed journal (Kret et.al. *A Respiratory Health Survey of a Subsurface Smoldering Landfill*, Environmental Research, 2018) shows there was no actual harm to the health of nearby residents. The study concludes that people living near the Bridgeton Landfill do not have elevated respiratory or related illness. (That article notes 52% of the detected odors reported by Bridgeton Landfill-area residents emanated from Missouri Champ, a different landfill nearby. In 2016 the Champ Landfill committed to $1.6 million in work on their gas extraction system to address excess emissions from the landfill.)

The safety of workers and neighbors is of the utmost importance to Bridgeton Landfill. That is why we have partnered with MDNR to monitor ambient air around the landfill since 2012. Results have consistently demonstrated the air did not in the past pose a health risk to our workers or our neighbors.

Summary of MDHSS Major Conclusions

The MDHSS Report offers five (5) major Conclusions and the Basis for Decision supporting each Conclusion. Conclusions 1, 2, and 3 summarize MDHSS evaluation of community health effects and exposure to reduced sulfur compounds (RSCs) and sulfur dioxide (SO_2) in ambient air near the Bridgeton Landfill. Conclusions 4 and 5 summarize MDHSS evaluation of community health effects from non-sulfur-based compounds and volatile organic compounds (VOCs) in ambient air near the landfill. The five Conclusions presented in the MDHSS Report are provided below.

MDHSS Conclusion 1. "In the past, breathing sulfur-based compounds [i.e., reduced sulfur compounds (RSCs) and sulfur dioxide (SO_2)] at concentrations detected in ambient air near the landfill may have harmed the health of people living or working near the landfill by aggravating chronic respiratory disease (e.g., asthma), aggravating chronic cardiopulmonary disease, or causing adverse respiratory effects such as chest tightness or difficulty breathing, especially in sensitive individuals (e.g., children, elderly adults). Breathing the odors of sulfur-based compounds may have also caused headache, nausea, or fatigue. Sulfur-based compounds were most frequently detected in ambient air near the landfill in 2013, prior to completion of remedial work at the landfill." (MDHSS Report page 3).

> Bridgeton disagrees with some of the major components of this Conclusion and the Basis for Decision. Detailed comments are provided below.

MDHSS Conclusion 2. "In the past, long-term or repeated exposure to sulfur-based compounds and their odors in air near the landfill may have harmed the health or affected the quality of life of people living or working near the landfill by increasing stress, impairing mood, or increasing the risk of respiratory infection." (MDHSS Report page 5).

> Bridgeton disagrees with some of the major components of this Conclusion and the Basis for Decision. Detailed comments are provided below.

MDHSS Conclusion 3. "Currently, fugitive emissions from the landfill have decreased significantly, and breathing sulfur-based compounds in ambient air near the landfill is unlikely to harm people's health. However, the odors of low concentrations of sulfur-based compounds may occasionally

affect the health or quality of life of people living or working near the landfill." (MDHSS Report page 6).

Bridgeton agrees with the first statement in Conclusion 3 but disagrees with the wording of the second statement-specifically that in the present time, odors of sulfur-based compounds may affect the health of people living or working near the Landfill. Detailed comments are provided below.

MDHSS Conclusion 4. "Breathing other (i.e. non-sulfur based) chemicals that have been detected in ambient air is not expected to harm people's health." (MDHSS Report page 6).

Bridgeton agrees with this Conclusion.

MDHSS Conclusion 5. "Current cancer risks from breathing VOCs near the landfill are similar to those in other urban environments in the United States. Over the long term, people living or working near the landfill are likely breathing ambient air concentrations similar to national average concentrations." (MDHSS Report page 7).

Bridgeton agrees with this Conclusion.

Comments by Bridgeton

Our comments are organized by general category with references to specific statements in the MDHSS Report. MDHSS relies almost exclusively on data reports from the MDNR AreaRAE® monitors to support their conclusions about the concentrations of RSCs and SO_2 in ambient air in the community surrounding Bridgeton Landfill, and inferred exposures to people who live and work near the Landfill. Specific health effects are attributed to the concentrations of RSCs and SO_2 recorded by the AreaRAE® monitors. The MDHSS Report further conflates causation of clinical illness (toxic effects) and symptoms associated with odors. Statements about causation and association are made together in the same conclusion and attributed to breathing reduced sulfur compounds. The MDHSS conclusions are written such that presumed health effects caused by breathing "combined Reduced Sulfur Compounds" (RSCs measured as H_2S) are not well distinguished from health effects presumed to be caused by breathing SO_2.

General Comment 1. MDHSS Conclusions 1, 2, and 3 are inter-related rather than separate conclusions that conflate health effects caused by exposure to RSCs and SO_2 with symptoms associated with unpleasant odors.

MDHSS conclusions regarding sulfur-based compounds conflate disease causation and temporary health effects associated with perception of odor. MDHSS concludes that in the past (2013 to 2014) exposures to the concentrations of reduced sulfur compounds and sulfur dioxide detected in ambient air "may have harmed the health of people living or working near the landfill by aggravating chronic respiratory disease (e.g. asthma), aggravating chronic cardiopulmonary disease, or causing adverse respiratory effects such as chest tightness or difficulty breathing, especially in sensitive individuals (e.g., children, elderly adults)." (Conclusion 1, pg. 3); and "by…increasing the risk of respiratory infection" (Conclusion 2, pg. 5).

Referring to the concentrations of RSCs and SO_2 in ambient air implies direct causation by a toxic response, meaning that the chemical disrupts normal physiological processes on the molecular and/or cellular level producing temporary or persistent harm that can be objectively measured (i.e. clinical illness). It appears that MDHSS concluded that people living or working near Bridgeton Landfill were exposed to sufficiently high concentrations of RSCs and SO_2 for sufficient time periods to exacerbate existing medical conditions, or cause illnesses, based on concentrations reportedly measured by the MDNR AreaRAE® sensors (primarily in 2013-2014).

MDHSS also concludes that "Breathing the odors of sulfur-based compounds may have also caused headache, nausea, or fatigue." (Conclusion 1, pg. 3), and "In the past, long-term or repeated exposures to sulfur-based compounds and their odors may have … affected the quality of life of people living or working near the landfill by increasing stress, impairing mood…" (Conclusion 2, pg. 5).

The presence of odors in the past did not mean that people were also being exposed to constituents from landfill gas at concentrations sufficiently high and for a sufficiently long period of time to cause a toxic response. There is a body of evidence that demonstrates an *association* between perception of offensive odors and transient health effects in humans. Objectional odors were reported more frequently in 2013 due to impacts from the subsurface reaction (SSR) and during Bridgeton's actions to mitigate the situation. Following installation of the Ethylene Vinyl Alcohol (EVOH) liner over the South Quarry of the Bridgeton Landfill (completed in fall of 2013), odors and odor complaints were drastically reduced. MDHSS conclusions about *causation* of adverse health effects is not supported.

A recent study by the St. Louis Department of Public Health published in a peer reviewed journal (Kret et.al. *A Respiratory Health Survey of a Subsurface Smoldering Landfill*, Environmental Research, 2018), relying on a full Community Assessment for Public Health Emergency Response (CASPER) health assessment completed by the St. Louis County Department of Public Health, directly refutes this claim specific to Bridgeton Landfill. The Department of Health study concludes that the results do not support the hypothesis that people living near the Bridgeton Landfill have elevated respiratory or related illness compared to those people who live beyond the vicinity of the landfill.

The same peer reviewed scientific article identifies other regional sources of odor in the vicinity of Bridgeton, including Champ Landfill. The article references a St. Louis County Department of Public Health (SLCDPH) study which found that 52% of the detected odors reported by Bridgeton Landfill-area residents emanated from Missouri Champ, a different landfill nearby (DPH, 2016).

General Comment 2. A fundamental flaw in the Health Consultation is MDHSS reliance on, and misinterpretation of, readings from the Missouri Department of Natural Resources (MDNR) AreaRAE® sensor measurements of hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) to infer community level exposures to sulfur-based compounds in ambient air.

In the Basis for Decision (Conclusion 1, pg.4), MDHSS states "*Occasionally, concentrations of combined RSCs and SO_2 have been detected at or above 100 parts per billion (ppb; the lower detection limit of the AreaRAE® monitors), exceeding conservative health-based guidelines for respiratory and neurological effects and sometimes exceeding concentrations shown in clinical studies to cause adverse respiratory effects".*

The health-based guidelines referenced by the MDHSS Report are ATSDR minimum risk levels (MRLs) for acute (less than 14 day) exposure to H_2S (70 ppb) and SO_2 (10 ppb) and California EPA's reference exposure level (REL) for acute (1-hour) exposure to H_2S (30 ppb). The Report also referenced a clinical study (ATSDR 1998) where people with asthma had adverse respiratory effects after breathing SO_2 at concentrations of 100 ppb or more for 10 minutes; and another study (ATSDR 2014) where people with asthma experienced adverse respiratory effects when breathing H_2S at concentrations of 2,000 ppb or more for 30 minutes.

Because the AreaRAE® data are central to MDHSS Conclusions 1, 2, and 3 regarding health effects, it is important to discuss the limitation of these instruments and the alternative analytical data for reduced sulfur compounds in ambient air. Figures showing the locations of the MDNR AreaRAE® monitors in April 2013 and from December 2013 to 2015 are provided in Attachment B.

Specific Comments on MDHSS Report Section 3 INVESTIGATIONS OF GAS AND ODOR EMISSIONS IN AMBIENT AIR

Section 3.2 MDNR Continuous Ambient Air Monitoring. This section discusses the locations and operation of the AreaRAE® monitors. Bridgeton offers the following comments on the limitations of the AreaRAE® sensors.

- AreaRAE® sensors are designed for industrial environments where there is potential for exposure to acutely hazardous concentrations of toxic gases and are not designed to detect low concentrations of H_2S or SO_2 in ambient air.
- The H_2S and SO_2 sensors are electrochemical sensors and require a minimum concentration of the target compound to be present before a measurement is registered. The AreaRAE® electrochemical sensors respond when a minimum of 100 ppb of H_2S or SO_2 is present and record levels in increments of 100 ppb every minute. Readings from the AreaRAE® sensors are either 0 or increments of 100 ppb, 200 ppb, etc.
- MDHSS assumes that the AreaRAE® H_2S sensor is measuring the total concentration of all "combined reduced sulfur" compounds present in ambient air. MDHSS specifically references cross sensitivity of the H_2S sensor to methyl mercaptan and assumes that the other RSCs detected in Bridgeton Landfill source gas would also elicit a response.
  - According to RAE Systems Technical Note TN-114, page 20 (April 2015) the H_2S sensor is cross-sensitive to these additional gases: carbon monoxide; carbon disulfide; ethyl sulfide; ethylene; hydrogen; hydrogen chloride; hydrogen cyanide; isobutylene; methyl mercaptan; methyl sulfide; ammonia; nitrogen oxide; nitrogen dioxide; phosphine; sulfur dioxide; toluene and turpentine. The Table below was extracted from the RAE Systems Technical Note showing cross-sensitivities of the H_2S sensor.

Cross-sensitivity Data, H_2S sensor		
Gas	**Concentration**	**Response**
CO	300 ppm	≤1.5 ppm
CS_2	100 ppm	0 ppm
Ethyl Sulfide	100 ppm	10 ppm[2]
Ethylene	100 ppm	≤0.2 ppm
H_2	3,000 ppm	0 ppm
HCl	10 ppm	0 ppm
HCN	10 ppm	0 ppm
Isobutylene	100 ppm	0 ppm
Methyl mercaptan	5 ppm	about 2 ppm
Methyl sulfide	100 ppm	9 ppm
NH_3	50 ppm	0 ppm
NO	35 ppm	<0.7 ppm
NO_2	5 ppm	about -1 ppm[1]
PH_3	5 ppm	about 4 ppm
SO_2	5 ppm	about 1 ppm
Toluene	10,000 ppm	0 ppm[2]
Turpentine	3,000 ppm	About 70 ppm[2]

Note: High levels of polar organic compounds including alcohols, ketones, and amines give a negative response.
1 - CAUTION! Negative cross-sensitivities may cause the sensor to produce lower readings than the true concentration of gas in ambient air.
2 - Estimated based on data from similar sensors.

  - The table of cross-sensitivities (above) indicates a concentration of 5 ppm (5,000 ppb) methyl mercaptan would cause the sensor to register 2 ppm (2,000 ppb) of H_2S. Much higher concentrations of ethyl sulfide and methyl sulfide are required to elicit a response.
  - This is important because quantitative analysis of Bridgeton Landfill source gas indicated that dimethyl sulfide was the dominant RSC. According to MDHSS (Footnote 1, page 4), RSCs in source gas were 76.5% dimethyl sulfide, 8.2% dimethyl disulfide, 4.8% methyl mercaptan, and 10.5% other RSCs including 1.6% hydrogen sulfide.
    - Of these, methyl mercaptan cross-reacts with the H_2S AreaRAE® and is present at 3 times the concentration of H_2S in source gas. Using an AreaRAE®, there is no way to discriminate whether data represents methyl mercaptan or H_2S concentrations in ambient air.
    - This is significant since the relative toxicities of these compounds are not equivalent.
- Although there are some other reduced sulfur compounds that may elicit a response, the AreaRAE® is designed to detect H_2S because of the acute hazard associated with this gas. Note that RAE Systems offers a sensor specific to methyl mercaptan. The MDHSS assumption that the H_2S AreaRAE® sensors are recording the level of all reduced sulfur compounds is not accurate and not consistent with the purpose of this instrument.
- According to RAE Systems Technical Note TN-114, page 26 the SO_2 sensor is cross-sensitive to the following additional gases: carbon monoxide; nitrogen oxide; nitrogen dioxide; ammonia; hydrogen sulfide; hydrogen; hydrogen cyanide; and ethylene. Hydrogen sulfide must be present at a concentration of at least 25 ppm to register as approximately 0.1 ppm of SO_2.
- The RAE Systems sensors in the AreaRAE® units are intended for use in emergency response and industrial settings to warn against acute, high level exposures. To be useful warning devices, the sensors must be highly specific for individual chemicals that pose acute hazards.

In footnote 13 on page 20, MDHSS acknowledges that potential issues with the MDNR AreaRAE® monitors including sensor drift, weather extremes, and MDNR failure to conduct routine checks of the sensors. MDHSS states that although some of those early AreaRAE® measurements were likely biased high, they treated all reported data as valid. This is an important statement because the MDHSS conclusions about exposure to RSCs and SO_2 and health effects in 2013-2014 are largely based on data from the MDNR AreaRAE® monitors that may not have been valid.

<u>Section 3.3 MDNR Ambient Air Sampling for Laboratory Analysis</u>. This section describes collection of air samples upwind and downwind of Bridgeton Landfill for laboratory analysis VOCs, aldehydes, and sulfur-based compounds.

- Laboratory methods were employed to quantify H_2S concentrations in ambient air on or surrounding Bridgeton Landfill.
  - MDNR and Bridgeton Landfill collected ambient air samples for quantitative analysis of individual RSCs by ASTM Method D-5504. ASTM Method D-5504 measures H_2S and other reduced sulfur compounds at levels of less than 20 ppb in ambient air.
    - On page 20 of their Report, MDHSS states that "From April 2013 through March 2015…sulfur-based compounds had not been detected in downwind ambient air samples at concentrations of concern."
    - H_2S was not detected in any onsite sample and is only a minor compound in source gas (1.6% per MDHSS), which demonstrates that Bridgeton landfill has not significantly contributed to hydrogen sulfide concentrations in the regional air mass.
      - **Given the fact that H_2S was not present at measurable concentrations in ambient air on the Bridgeton Landfill using ASTM Method D-5504, it is highly unlikely that AreaRAE® sensor measurements collected at off-site locations further away were detecting H_2S or other sulfur-**

based compounds originating from the landfill at levels greater than 100 ppb.

- The USEPA employed Tetra Tech, Inc to conduct passive/diffusive sampling methods (Radiello Passive Diffusion Samplers, December 2015 to March 2015) to quantify H_2S concentrations near Bridgeton Landfill. Reporting limits using this method ranged from 0.12 ppb to 0.18 ppb (Tetra Tech, 2015).
  - Detected concentrations ranged 0.12 to 0.46 ppb and the report concludes that: "No statistically significant differences in H_2S concentrations were found among the five WLLS air monitoring stations, and the concentrations were consistent with typical H_2S concentrations within outdoor urban environments."
  - ***On page 29 of the Health Consultation MDHSS states "Concentrations of H_2S in ambient air in urban areas in the United States are typically at or below 1 ppb (ATSDR, 2014). Maximum concentrations have ranged from 2.8 ppb to 6.3 ppb in urban areas…." This directly supports the conclusion that H_2S concentrations detected in ambient air near the landfill are consistent with concentrations observed in ambient air in urban settings.***

- It is critical to contrast the ASTM Method D-5504 laboratory detection limits for individual reduced sulfur compounds of 20 ppb for a 4-hour air sample collected in a vacuum canister and a detection limit of 0.18 ppb H_2S collected over a 2-week period with Passive Diffusion samplers with the minimum sensitivity of the AreaRAE® H_2S and SO_2 monitors of 100 ppb. In addition, the AreaRAE® is prone to cross-sensitivities leading to less sensitive results as discussed in previous sections.
  - However, in arriving at their conclusions that breathing sulfur-based compounds may have caused health effects (2013-2014), MDHSS largely ignores the available laboratory analytical data in favor of the AreaRAE® data. This laboratory analytical data identifies and quantifies individual RSCs (on the target analyte list for ASTM Method D-5504) and more accurately captures ambient air exposure levels than AreaRAE® data.
  - More importantly, the MDNR monitoring results for reduced sulfur compounds using the sensitive ASTM Method D-5504 represent the same time period that MDHSS asserts in "Conclusion 1" that "In the past, breathing sulfur-based compounds [i.e., reduced sulfur compounds (RSCs) and sulfur dioxide (SO_2) at concentrations detected in ambient air near the landfill may have harmed the health of people living or working near the landfill by aggravating chronic respiratory disease…Sulfur based compounds were most frequently detected in ambient air near the landfill in 2013…". **Thus, MDHSS's conclusion of health impact is wholly inconsistent with quantitative data available for the time period of interest.**

Specific Comments on MDHSS Report Section 4 EXPOSURE EVALUATION AND CHEMICAL SCREENING ANALYSIS

Section 4.1.1 Conceptual Exposure Model

- On page 28 of the Report, MDHSS states "*After the onset of the SSE and prior to completion of corrective action at the landfill in 2013-2014, fugitive emissions were likely a substantial percentage of total emissions from the landfill. Fugitive emissions are likely captured by MDNR's monitoring and sampling network, which was located between the landfill and nearby receptor populations (or within nearby residential communities*)." As stated above, some of the H_2S and SO_2 concentrations recorded by the MDNR AreaRAE® sensors may have been biased high during this critical time period.

Section 4.1.2 Evidence of Exposure

- On page 28, MDHSS states that "Evidence of people's exposure to Bridgeton Landfill gases includes the periodic perception of distinctive, offensive odors in residential and commercial areas surrounding the landfill." "MDNR reported detecting landfill odors at 7.8% of all surveillance stops in 2013, 3.6% of stops in 2014…".
  - This would suggest that odors were sporadic/episodic and not sustained over long periods of time, and by inference exposures were sporadic.
- On page 29, MDHSS describes landfills as common sources of H_2S, SO_2, and RSCs and provides examples of the low odor thresholds associated with these compounds. The odor thresholds for H_2S, dimethyl sulfide, and methyl mercaptan are much lower than 100 ppb, the lowest sensitivity of the AreaRAE® sensor, and are also lower than or close to the detection limit of 20 ppb for ASTM Method D-5504 for the 4-hour air samples collected in vacuum canisters.
  - The odor thresholds for these RSCs are also lower than the health-based guidelines referenced by MDHSS (Footnote 1, page 4).
  - The constituents most associated with the odor are reduced sulfur compounds (dimethyl sulfide and some mercaptans) and carboxylic acids (butanoic acid). These groups of compounds have objectionable odors, often described as "body odor", "decaying cabbage", and "vomit". We note that MDHSS does not mention carboxylic acids.
  - Most people can smell reduced sulfur compounds at concentrations lower than what even sensitive analytical methods can measure and many hundreds to thousands of times lower than concentrations that might produce an actual toxic response.
  - As such, although people may be able to observe the odor at very low at concentrations, these concentrations are not representative of concentrations that may cause toxic exposures.
- Since the RSCs and SO_2 are common landfill gases, it cannot be concluded that Bridgeton Landfill would have been the only source of the odors (and inferential exposures). A St. Louis County Department of Public Health study found that 52% of the detected odors reported by Bridgeton Landfill-area residents emanated from Missouri Champ, a different landfill nearby (DPH, 2016).
- It should also be noted that the MDNR AreaRAE® sensors were placed in locations where other sources of SO_2 and H_2S were likely to be present in ambient air at ground level; within 10 feet of the St. Louis Metropolitan Sewer District lift station vault, the intersection of busy roads (car exhaust can be a common source of SO_2 and H_2S), and in a mobile home neighborhood.

Section 4.2 Screening of Chemicals in Ambient Air

In this section MDHSS describes their approach for comparing concentrations of RSCs and SO_2 reported by the MDNR AreaRAE® sensors and the Jerome H_2S meter to ATSDR Minimal Risk Levels (MRLs).

- Since MDHSS relies on ATSDR MRLs to support some of their conclusions about adverse health effects, it is important to understand the definition of these screening levels (https://www.atsdr.cdc.gov/mrls/index.asp). According to the ASTDR website:
    - "*An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. These substance specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites.* ***It is important to note that MRLs are not intended to define clean up or action levels for ATSDR or other Agencies."***
    - *"ATSDR uses the no observed adverse effect level/uncertainty factor (NOAEL/UF) approach to derive MRLs for hazardous substances. They are set below levels that, based on current information, might cause adverse health effects in the people most sensitive to such substance-induced effects. MRLs are derived for acute (1-14 days), intermediate (>14-364 days), and chronic (365 days and longer) exposure durations, and for the oral and inhalation routes of exposure. Currently MRLs for the dermal route of exposure are not derived because ATSDR has not yet identified a method suitable for this route of exposure. MRLs are generally based on the most sensitive substance-induced end point considered to be of relevance to humans. ATSDR does not use serious health effects (such as irreparable damage to the liver or kidneys, or birth defects) as a basis for establishing MRLs. Exposure to a level above the MRL does not mean that adverse health effects will occur."*
- On page 31, MDHSS acknowledges that the levels at which the AreaRAE® sensors can detect H_2S and SO_2 are higher than protective health-based screening levels for continuous exposure over sustained periods of time.
    - Any detection would be above the screening levels.
    - It should be noted that MDHSS does not consider the laboratory analytical data for RSCs in ambient air in their screening process.
- On page 32, Section 4.2.1 MDHSS states that "…instantaneous concentrations of H_2S measured by MDNR with the Jerome® meter exceeded Cal EPA's acute REL in only one instance (in 2013). The reading did not exceed ATSDR's acute MRL. In four instances (two in 2013, one in 2014, and one in 2016), H_2S concentrations exceeded ATSDR's screening level for intermediate exposure (20 ppb).
    - **Comparing instantaneous readings to Cal EPA acute RELs (protective for acute exposure over 8 hours), Acute MRLs (protective over 1 to 14 days of exposure) or Intermediate MRLs (protective over 15 to 364 days of exposure) is not warranted and is simply misleading.**
    - **Instantaneous readings do not represent continuous exposure over longer periods of time and are not consistent with the assumptions used to derive screening levels (e.g. exposure duration). Comparing instantaneous readings to screening values based on longer exposure durations is overly conservative and misrepresents the conditions of exposure where health effects have been observed in people.**
- MDHSS also compared readings from the AreaRAE® H_2S sensors to an odor threshold of 385 ppb for RSCs that MDHSS derived from AIHA ERPG-1 (emergency planning guidelines) for individual reduced sulfur compounds. The usefulness of the MDHSS derived odor threshold for evaluating potential exposures to combined RSCs in ambient air is not clear.

Specific Comments on MDHSS Report Section 5 PUBLIC HEALTH IMPLICATIONS

Section 5.1.1 Hydrogen Sulfide

- On page 38, MDHSS discusses H_2S concentrations measured by MDNR using a Jerome® meter. It should be noted that the Jerome® instrument is specific to H_2S and MDHSS does not refer to readings from this meter as combined RSCs. However, the following compounds may cause the gold film sensor on the Jerome® meter to respond: chlorine, ammonia, NO_2, and mercaptans and thiols. Note that water vapor condensation on the gold film can cause irreparable harm to the sensor and must be avoided.
- MDHSS makes the following statements about response to hydrogen sulfide odors.
    - "In 2013-2016, MDNR detected H_2S approximately 47% of the time during their twice-daily routine surveillance with hand-held meters to 2 miles from the landfill."
    - "It is therefore expected that people living or working near the landfill and in the Bridgeton area may have occasionally been able to smell H_2S in ambient air."
    - And, "If exposures to those concentrations occurred for a sufficient period of time on those days, sensitive individuals living or working in that area may have considered H_2S concentrations offensive and may have experienced adverse neurological effects such as headache and nausea."
- These statements and subsequent conclusions are not supported by the facts at the site.
    - H_2S is a very small percentage of the reduced sulfur compounds detected in Bridgeton Landfill source gas (1.6% according to MDHSS).
    - H_2S has a distinctive rotten egg odor that has not been observed on the landfill or in downwind monitoring locations.
    - Dimethyl sulfide was the dominant RSC contributing to the Bridgeton Landfill odor.
- MDHSS statements about exposures to H_2S up to 2 miles away causing health effects based on MDNR Jerome® meter recordings are not consistent with the documented conditions at Bridgeton Landfill.

Section 5.1.1.2 Adverse Effects of Breathing Hydrogen Sulfide

- After the previous discussion regarding exposures to H_2S and health effects, on page 39 MDHSS states that "Breathing H_2S in ambient air near the landfill is not expected to have caused adverse respiratory or olfactory effects that were observed in the clinical studies used to derive ATSDR's MRLs for H_2S."
- Also, on page 39, MDHSS states that "The average concentration of H_2S in ambient air near the landfill was far below exposure levels shown in that study (used to derive the US EPA Reference Concentration) to have no adverse effects…EPA's RfC is a concentration unlikely to pose appreciable risk over a long-term period of exposure, even in sensitive individuals."

Section 5.1.2 Reduced Sulfur Compounds

- On page 40, MDHSS states that "maximum H_2S concentrations detected by the MDNR fixed AreaRAE® H_2S monitors near the landfill were substantially higher than maximum concentrations of H_2S measured by the Jerome® meter around the landfill."
- MDHSS then goes on to speculate that the peak concentration of H_2S measured by the AreaRAE® sensors as a percentage of combined RSCs was similar to the peak concentration detected by the Jerome® meter.
- This disregards the laboratory analytical data for ambient air.

Section 5.1.2.1 Response to Reduced Sulfur Compound Odors

- On pages 41 and 42, MDHSS compares AreaRAE® H_2S sensor readings to odor thresholds for individual RSCs and the total RSC odor threshold derived by MDHSS.

Section 5.1.2.3 Adverse Effects of Acute Exposure to Reduced Sulfur Compounds

- On pages 43-44, MDHSS compares AreaRAE® H_2S sensor measurements (assumed to represent total combined RSCs) to health-based screening levels for H_2S to assess the potential for adverse respiratory effects from acute exposures. MDHSS makes the assumption that the toxicity of the other reduced sulfur compounds detected in Bridgeton Landfill source gas (dimethyl sulfide, dimethyl disulfide, methyl mercaptan, and others) is equal to the toxicity of H_2S. MDHSS acknowledges that this is a very conservative assumption.
    - When inferring health effects caused by exposure to total reduced sulfur compounds (as opposed to perception of an objectionable odor), it is essential to separate H_2S from the other reduced sulfur compounds detected in the landfill gas with regard to toxicity.
    - Hydrogen sulfide produces toxic effects at lower levels of exposure than any of the other compounds (ASTDR 2014).
- On page 44, MDHSS compares hourly maximum AreaRAE® measurements of H_2S to ATSDR MRLs and the health effects reported in the studies used by ATSDR to derive the MRLs.
- MDHSS states that “In 2013, people living or working near the landfill were most likely to have experienced aggravated respiratory illnesses or respiratory symptoms from acute exposure to combined RSCs in ambient air.” These statements are carried forward into MDHSS Conclusions 1, 2, and 3.
- This misinterpretation of the AreaRAE® data to infer exposure and causation of illness is one of the major flaws in the MDHSS Report.
    - **Sporadic one-minute readings from the AreaRAE® sensors do not equate to sustained exposure consistent with the conditions under which health effects occurred in the studies relied on by ATSDR.**
    - And, as acknowledged by MDHSS previously, data from the AreaRAE® sensors during 2013-2014 may have been unreliable.
- Thus, MDHSS conclusions about exposure to sulfur-based compounds and causation of health effects are likely based on both poor assumptions and unreliable data.

Section 5.1.3.1 Response to Sulfur Dioxide Odors

- On page 49, MDHSS concludes that “People living or working near the landfill were not likely bothered by SO_2 odors.”
- Bridgeton concurs with that conclusion.

Section 5.1.3.2 Adverse Effects of Acute Exposure to Sulfur Dioxide

- As with their evaluation of exposures to RSCs, MDHSS compared hourly maximum concentrations of SO_2 recorded by the AreaRAE® sensors to the ATSDR acute MRL and US EPA’s Air Quality Index. The ATSDR acute MRL is based on a clinical study in which some individuals with mild asthma who were exposed to 100 ppb sulfur dioxide exhibited measurable airway resistance during exercise.
- On page 51-52, MDHSS states that “SO_2 concentrations detected in ambient air near Bridgeton Landfill were occasionally at or above 200 ppb, falling primarily within an AQI concentration range that, over sufficient time periods, could cause adverse respiratory effects in the general population, especially in sensitive individuals, during periods of activity…”.
- MDHSS carried this evaluation forward into Conclusions 1, 2, and 3. Bridgeton notes that misinterpretation of sporadic detections of SO_2 by the AreaRAE® sensors to infer exposure is not consistent with conditions where people experienced health effects caused by SO_2. And, as acknowledged by MHDSS previously, data from the AreaRAE® sensors in 2013-2014 may have been unreliable.

<u>Section 5.1.4 Supporting Community Studies</u>

In this section of the report, MDHSS summarizes studies where health effects were reported in communities associated with Acute Exposures (Section 5.1.4.1) and Long-term Exposures (Section 5.1.4.2) to reduced sulfur compounds.

- The first study described by MDHSS (page 54) is the previously referenced survey conducted in February and March 2016 by the St. Louis County Department of Public Health (SLCDPH). The survey reported that a higher percentage of households within a 2-mile radius of the landfill (Bridgeton) reported shortness of breath within the previous 12 months compared to households in a reference area. The findings of this study were subsequently published in the journal Environmental Research (Kret et. al., 2018), and do not support the conclusions of the MDHSS report.
- The authors conclude that "…the results do not support the hypothesis that people living near the Bridgeton Landfill have elevated respiratory or related illness compared to people who live beyond the vicinity of the landfill".
    - The differences in prevalence of asthma and COPD between the landfill group and the reference group were not statistically significant.
    - Landfill households reported significantly more "other respiratory conditions"; "attacks of shortness of breath"; "frequency of odor perceptions"; and "worry about neighborhood environmental issues" than referent households.
    - The authors referenced analytical results from comprehensive air sampling conducted by "MDNR and their contractors" but do not specifically reference AreaRAE® data.
    - And "Notably, a DPH air monitoring study found that 52% of the detected odors reported by Bridgeton Landfill area residents emanated from the Missouri Champ, a different landfill nearby".
- On page 55, MDHSS references other community studies that "support the possibility that some individuals living or working near Bridgeton Landfill may have experienced respiratory effects (such as chest tightness, wheezing, or difficulty breathing) and neurological symptoms (such as headache and nausea) as a result of acute exposures to low concentrations of H_2S and other RSCs in the ambient air, whether by toxicological or odor-related mechanisms."
    - As stated previously, conditions on and around Bridgeton Landfill as documented by laboratory analysis of ambient air do not support conclusions about causation of respiratory health effects by toxicological mechanisms.

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Attachments

TABLES

Table 1: Comprehensive Sampling Events 2012 through 2015 – Bridgeton Landfill
Upwind Comparison of Detected Compounds
Concentration in Ambient Air – All Units µg/m^3

Analyte	Screening Levels		Upwind Perimeter Sample Locations																
	Ind. RSL [1]	Res. RSL [2]	Grassy Knoll Center	Grassy Knoll West	Grassy Knoll North	Grassy Knoll Center	Grassy Knoll West	Grassy Knoll North	Grassy Knoll Lower Level	Grassy Knoll Upper Level	Pond	Grassy Knoll Lower Level	Grassy Knoll Upper Level	Grassy Knoll Lower Level	Grassy Knoll Lower Level	Corner of East Fence & Retention Pond	Upwind Grab – Grassy Knoll	South Fence	Grassy Knoll Upper Level
			August - 2012						May - 2013			July - 2014			January – 2015			July - 2015	
			16-Aug	16-Aug	16-Aug	17-Aug	17-Aug	17-Aug	7-May	7-May	8-May	29-Jul	30-Jul	31-Jul	27-Jan	28-Jan	29-Jan	28-Jul	29-Jul
Aldehydes/Carbonyl Compounds – Method: EPA TO-11a																			
2,5-Dimethylbenzaldehyde	NA [3]	NA	-- [4]	--	--	**0.41** [5]	**0.51**	**0.81**	**0.4**	**0.4**	--	--	--	NS [6]	--	--	NS	--	--
Acetaldehyde	5.6	1.3	**17** [7]	**19**	**18**	**1.3**	**1.2**	**1.2**	**1.3**	**1.1**	**1.3**	**1.1**	**2.5**	NS	**0.92 (1.2)** [8]	**1.1**	NS	**2.4J** [9] **(2.3J)**	**1.4J**
Benzaldehyde	NA	NA																**0.46 (0.44)**	**0.70**
Butyraldehyde	NA	NA																**<0.35UJ** [10, 11] **(1.8UJ)**	**1.2**
Formaldehyde	0.94	0.22	--	--	--	**2.9**	**3.1**	**3.2**	**2.3**	**2.4**	**2.9**	**2.4**	**2.6**	NS	**0.93 (0.92)**	**1.1**	NS	**12 (12)**	**4.2**
n-Hexaldehyde	NA	NA	--	--	--	--	--	--	**0.3**	--	**0.8**	--	**0.51**	NS	**0.56 (0.46)**	**0.62**	NS	--	--
Hydrogen Cyanide – Method: NIOSH 6010																			
Hydrogen Cyanide	3.5	0.83	--	--	--	--	--	--	--	--	--	--	NS	NS	--	NS	NS	--	NS
Amine Compounds – Method: NIOSH 2010m																			
No Compounds Detected	NA	NA	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	NS	--	--
Hydrogen Chloride – NIOSH 7903																			
Hydrogen Chloride	8.8	2.1	NS	NS	NS	NS	NS	NS	**11**	--	--	NS	NS	NS	NS	NS	NS	NS	NS
Sulfur Dioxide – Method: OSHA ID 200																			
Sulfur Dioxide	NA	NA	NS	NS	NS	NS	NS	NS	--	--	--	NS	NS	NS	NS	NS	NS	NS	NS
Mercury – Method: NIOSH 6009																			
Mercury	1.3	0.31	--	--	--	--	--	--	--	--	--	--	--	NS	--	NS	NS	--	NS
Ammonia – Method: *OSHA ID 188*																			
Ammonia	440	100	--	--	--	--	--	--	--	--	--	NS	--	NS	--	--	NS	--	--
Carboxylic Acid Compounds – Method: CAS AQL 102																			
Acetic Acid	NA	NA	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	NS	22	--
Volatile Organic Compounds (VOCs) – Method: EPA TO15 + TICs – Standard Analyte List																			
1,2,4-Trimethylbenzene	31	7.3	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.82** (<0.67)	--	--	**0.42J** (<0.78)
1,2-Dichloroethane	0.47	0.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.61J** (<0.78)
1,3,5-Trimethylbenzene	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.73** (<0.67)	--	--	--
1,4-Dioxane	2.5	0.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**13J** (<0.78UJ)
2-Butanone (MEK)	22,000	5,200	--	--	--	--	--	--	--	--	--	**0.64**	**0.56**	--	**0.42J**	**0.43J (0.41J)**	--	**1.8J**	**1.3J (0.91J)**
Isopropyl Alcohol	31,000	7,300	--	--	--	--	--	--	--	--	--	**1.1**	--	--	**4.3J,B** [12]	--	--	**7.0J**	**1.1J (0.73J)**
4-Methyl-2-pentanone	13000	3100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.92 **(0.48J)**
Acetone	140,000	32	**12**	**13**	**21**	--	--	--	--	--	**6.5**	**7.5**	**9**	--	**4.2J,B**	**3.7J,B (3.5J,B)**	**4.1 J,B**	**14**	**34J (9.3J)**
Acetonitrile	260	63	--	--	--	**0.78**		**0.88**	**4.8**	**6**	**0.79**	**12**	**0.43**	--	**240 D**	--	--	**0.64J**	**0.52J (0.34J)**
Acrolein	0.088	0.021	--	--	--	--	--	--	--	--	--	**0.34**	**0.27**	--	--	--	--	**0.47J**	**0.71J (0.29J)**
Benzene	1.6	0.36	--	--	--	--	--	--	--	--	--	**0.23**	--	--	**0.38 J,B**	**1.9 J (0.65J,B)**	--	**0.95**	--
Carbon Disulfide	3,100	730	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.88J**	--	**0.29J** (<7.8)
Carbon Tetrachloride	2	0.47	--	--	--	--	--	--	--	--	--	**0.48**	**0.45**	--	**0.49J**	**0.48J (0.51J)**	--	**0.39J**	**0.47J (0.45J)**
Chloromethane	390	94	--	--	--	--	--	--	--	--	--	**0.34**	**0.45**	--	**0.50J**	**0.49J (0.49J)**	**0.76J**	--	<0.92 **(0.25J)**
Cyclohexane	26,000	6,300	--	--	--	--	--	--	--	--	--	--	--	--	**--**	**3.4 J (<1.3 UJ)**	--	--	--
Dichlorodifluoromethane (CFC 12)	440	100	**2.1**	**2.2**	**2.2**	**2.1**	**2.2**	**2.2**	**2.5**	**2.8**	**2**	**2.1**	**2**	**2.3**	**2.3**	**2.2 (2.1)**	**2.4**	**2.0**	**2.4 (2.3)**
d-Limonene	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.35J**	--
Ethanol	NA	NA	--	--	--	--	--	--	--	--	--	**2.7**	**3.8**	--	**1.9J**	**1.9J (1.9J)**	--	**5.7J**	**4.4J (3.5J)**
Ethyl Acetate	310	73	**2.6**	**3**	**2.7**	--	--	--	--	--	--	**5.2**	**4.6**	--	**6.8**	**1.5 (1.3J)**	--	**2.5**	**5.2J (3.0J)**
Ethylbenzene	4.9	1.1	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.52J (<0.67)**	--	--	--
m,p-Xylenes	880	200	--	--	--	--	--	--	--	--	--	**0.41**	--	--	--	**5.2 J** (<1.3 UJ)	--	--	--
Methyl Methacrylate	3,100	730	--	--	--	--	--	--	--	--	--	**--**	--	--	--	**1.9J** (<1.3UJ)	--	--	--
Methylene Chloride	1,200	100	--	--	--	--	--	--	**6.6**	**4.7**	**0.68**	**1.7**	**1.5**	--	**3.4**	**0.35J (0.38J)**	**0.85J**	**0.54J**	**0.76J (0.37J)**
n-Butyl Acetate	NA	NA	--	--	--	--	--	--	**1.5**	--	--	--	--	--	--	**--**	--	--	**1.5J** (<0.78J)
n-Heptane	NA	NA	--	--	--	--	--	--	**--**	--	--	--	--	--	--	**4.2 J (0.27)**	--	--	--
n-Hexane	3,100	730	--	--	--	--	--	--	--	--	--	**0.2**	--	--	**0.50J**	**3.5 J (0.70 J)**	--	**0.76J**	**0.45J** (<0.78)
n-Nonane	88	21	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.1** (<0.67 UJ)	--	--	**0.33J** (<0.78)
n-Octane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.9J** (<0.67UJ)	--	--	**0.40J** (<0.78)
o-Xylene	440	100	--	--	--	--	--	--	--	--	--	**--**	--	--	--	**0.85 J (<0.67 UJ)**	--	--	--
Propene	13,000	3,100	--	--	--	--	--	--	--	--	**1.1**	**0.72**	--	**2.1**	**2**	--	--	**4.7**	<0.92 **(0.52J)**
Tetrachloroethene	47	11	**1.4**	--	--	--	**1.8**	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	22,000	5,200	**1**	**1.4**	**1.1**	--	--	--	**3.1**	--	**1.4**	**2.2**	**0.87**	**1.8**	**0.88J**	**6.1 J (0.95 J)**	--	**1.2**	**14J (0.57J)**

Table 1: Comprehensive Sampling Events 2012 through 2015 – Bridgeton Landfill
Upwind Comparison of Detected Compounds
Concentration in Ambient Air – All Units $\mu g/m^3$

Analyte	Screening Levels		Upwind Perimeter Sample Locations																
	Ind. RSL [1]	Res. RSL [2]	Grassy Knoll Center	Grassy Knoll West	Grassy Knoll North	Grassy Knoll Center	Grassy Knoll West	Grassy Knoll North	Grassy Knoll Lower Level	Grassy Knoll Upper Level	Pond	Grassy Knoll Lower Level	Grassy Knoll Upper Level	Grassy Knoll Lower Level	Grassy Knoll Lower Level	Corner of East Fence & Retention Pond	Upwind Grab – Grassy Knoll	South Fence	Grassy Knoll Upper Level
			August - 2012						May - 2013			July - 2014			January – 2015			July - 2015	
			16-Aug	16-Aug	16-Aug	17-Aug	17-Aug	17-Aug	7-May	7-May	8-May	29-Jul	30-Jul	31-Jul	27-Jan	28-Jan	29-Jan	28-Jul	29-Jul
Trichloroethene	0.88	0.21	--	--	--	--	--	--	--	--	**0.97**	--	--	--	--	--	--	--	--
Trichlorofluoromethane	3,100	730	--	--	--	--	--	--	--	--	--	**1.1**	**1.2**	--	**1.3**	**1.3 (1.3)**	**1.3J**	**1.1**	**1.1 (1.1)**
Trichlorotrifluoroethane	130,000	31,000	**1.1**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	--	--	**1**	**0.52**	**0.54**	--	**0.47J**	**0.53J (0.51J)**	--	**0.45J**	**0.54J (0.49J)**
Vinyl Acetate	880	210	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**1.3J**	--
Volatile Organic Compounds (VOCs) –Method: EPA TO15 + TICs - Tentatively Identified Compounds [13]																			
n-Pentane	4,400	1,000	--	--	--	--	--	--	**50**	--	--	--	--	--	--	**3.1**	--	--	--
Chlorodifluoromethane	220000	52000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		**-- (4.2)**
Sulfur Dioxide	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**>26 ! [14]**	--	--
Isopentane	NA	NA	--	--	--	--	--	--	--	--	**3.2**	--	--	--	--	--	--	--	--
Isoprene	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.9 (3.5)**
Propane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.6 (3.4)**	--	--	**12** (--)
n-Butane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.8 (3.0)**	--	--	**7.1** (--)
2-Methylpentane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.4**	--	--	--
Methylcyclopentane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.6**	--	--	--
Methylcyclohexane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**12**	--	--	--
Dimethylcyclohexane isomer	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.3**	--	--	--
Ethyl propionate	NA	NA	**5**	**4.7**	**5.2**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl butyrate	NA	NA	**7.6**	**6.5**	**7.9**	**5.4**	**6**	**5.6**	--	--	--	--	--	--	--	--	--	--	--
Trimethylsilanol	NA	NA	--	--	--	--	--	--	--	--	--	**2.9**	**3.2**	--	--	--	--	**16**	**17 (3.1)**
Acetic Acid	NA	NA	--	**3.7**	--	--	--	--	--	--	--	--	--	--	--	--	--	**6.7**	**-- (5.1)**
Benzaldehyde	NA	NA	--	--	**3.4**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexamethylcyclotrisiloxane	NA	NA	**3.3**	--	**12**	--	--	--	--	**14**	--	**4.2**	**26**	--	--	**3.9**	**16**	**86UJB**	**4.4UJB (7.6 UJB)**
n-Decane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.7**	--	--	--
n-Octanal	NA	NA	--	--	--	--	--	--	**8.7**	**15**	--	--	**5**	--	--	--	--	--	--
n-Nonanal	NA	NA	--	--	--	--	--	--	**24**	**19**	**3.5**	**4.2**	**24**	--	--	--	--	**3.8**	--
2-Ethylhexylacetate	NA	NA	--	--	--	--	--	--	**15**	**19**	--	--	--	--	--	--	--	--	--
2-Ethyl-1-hexanol	NA	NA	--	--	--	--	--	--	**34**	**21**	--	--	--	--	--	--	--	--	--
n-Decanal	NA	NA	--	--	--	--	--	--	**17**	--	--	--	**22**	--	--	--	--	--	--
C13H28 Branched Alkane	NA	NA	--	--	--	--	--	--	**5.8,5.6**	--	--	--	--	--	--	--	--	--	--
Unidentified Siloxane	NA	NA	--	--	--	--	--	--	**13**	**21**	--	**8.9**	--	--	--	--	--	--	--
C14H30 Branched Alkane	NA	NA	--	--	--	--	--	--	**8.5**	--	--	--	--	--	--	--	--	--	--
unknown (9.48)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**4.2**	**-- (4.0)**
unknown (23.04)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.6**	--
unknown siloxane (20.11)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**21**	--
unknown siloxane (21.82)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**13**	--
Unidentified Siloxane	NA	NA	--	--	--	--	--	--	**11**	**14**	--	**13**	**98**	--	--	--	--	--	--
C15H32 Branched Alkane	NA	NA	--	--	--	--	--	--	**7.2**	--	--	--	--	--	--	--	--	--	--
Unidentified Siloxane	NA	NA	--	--	--	--	--	--	--	--	--	**3.4**	**2.7**	--	--	**4.7**	--	--	--
Unidentified Compound	NA	NA	**3.3**	--	**4.6**	--	--	--	**6.1**	--	**5.9**	**3.7**	**20**	--	--	--	--	--	--
Unidentified Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**3.3**	--	--	--	--	--	--
Reduced Sulfur Compound – ASTM D5504																			
No Compounds Detected	NA	NA	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polynuclear Aromatic Hydrocarbons - Method: EPA TO13a Modified																			
Acenaphthene	NA	NA	NS	NS	NS	NS	NS	NS	NS	**0.0036**	NS	**0.008**	NS	NS	--	NS	NS	**0.0076 J**	NS
Fluoranthene	NA	NA	NS	NS	NS	NS	NS	NS	NS	**0.0038**	NS	**0.0032**	NS	NS	--	NS	NS	**0.0061**	NS
Fluorene	NA	NA	NS	NS	NS	NS	NS	NS	NS	**0.0056**	NS	**0.0088**	NS	NS	--	NS	NS	**0.01**	NS
Naphthalene	0.36	0.072	NS	NS	NS	NS	NS	NS	NS	**0.048**	NS	**0.067**	NS	NS	**0.031**	NS	NS	**0.04 J**	NS
Phenanthrene	NA	NA	NS	NS	NS	NS	NS	NS	NS	**0.016**	NS	**0.022**	NS	NS	**0.0032**	NS	NS	**0.024**	NS
Pyrene	NA	NA	NS	NS	NS	NS	NS	NS	NS	**0.0016**	NS	--	NS	NS	--	NS	NS	**0.0026**	NS
Polychlorinated Dibenzo-p-Dioxins, Dibenzofurans – EPA Method TO-9A																			
2,3,7,8-TCDD	3.20E-07	6.40E-08	**1.94E-08**	NS	NS	NS	NS	NS	NS	**1.22E-08**	NS	**2.74E-10**	NS	NS	**5.05E-10**	NS	NS	**6.37E-10**	NS

1. United States Environmental Protection Agency Regional Screening Levels for Industrial Air
2. United States Environmental Protection Agency Regional Screening Levels for Residential Air
3. “NA” = Not Available
4. “--”: Compound not detected

Table 1: Comprehensive Sampling Events 2012 through 2015 – Bridgeton Landfill Upwind Comparison of Detected Compounds Concentration in Ambient Air – All Units µg/m³																			
Analyte	Screening Levels		Upwind Perimeter Sample Locations																
	Ind. RSL [1]	Res. RSL [2]	Grassy Knoll Center	Grassy Knoll West	Grassy Knoll North	Grassy Knoll Center	Grassy Knoll West	Grassy Knoll North	Grassy Knoll Lower Level	Grassy Knoll Upper Level	Pond	Grassy Knoll Lower Level	Grassy Knoll Upper Level	Grassy Knoll Lower Level	Grassy Knoll Lower Level	Corner of East Fence & Retention Pond	Upwind Grab – Grassy Knoll	South Fence	Grassy Knoll Upper Level
			August - 2012						May - 2013			July - 2014			January – 2015			July - 2015	
			16-Aug	16-Aug	16-Aug	17-Aug	17-Aug	17-Aug	7-May	7-May	8-May	29-Jul	30-Jul	31-Jul	27-Jan	28-Jan	29-Jan	28-Jul	29-Jul

5. Bold indicates that compound was detected above MRL
6. "NS" = Not Sampled
7. Shading indicates that the detected concentration exceeds the United States Environmental Protection Agency Regional Screening Level for ***Residential Air or Industrial Air.***
8. Values in parenthesis are duplicate sample concentrations.
9. J = The result is an estimated concentration that is less than the MRL but great than or equal to the Method Detection Limit (MDL).
10. "<": Compound concentration not detected above Method Reporting Limit (MRL). This are presented only with duplicate samples.
11. UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
12. B = Compound detected in Trip Blank or Laboratory Method Blank
13. Tentatively Identified compounds – under EPA Method TO-15 + TICs, the reported concentrations are estimated.
14. "!"= Previous studies shown that EPA Method TO-15 is not an appropriate method for quantifying Sulfur Dioxide.

NOTE: Trip Blanks were analyzed for each analyte . Analytical results for compounds detected in any trip blank have been amended with applicable data qualifiers.

Table 2: Comprehensive Sampling Events 2012 through 2015 – Bridgeton Landfill

Downwind Comparison of Detected Compounds

Concentration in Ambient Air – All Units µg/m^3

Analyte	Screening Levels		Downwind Perimeter Sample Locations																							
	Ind. RSL [1]	Res. RSL [2]	Pond Center	Pond East	Pond West	East Fence #1	East Fence #2	South Fence	MSD Lift Stn.	Materiologic East End	Northwest Auto Repair	Southeast Corner	East Fence	Retention Pond	East Fence	Republic Fueling	SW Corner of Landfill	Corner of East Fence & Retention Pond	East Fence	Grassy Knoll North of Pipe Staging Area	Grassy Knoll North of Asphalt Plant West of Pipe Staging Area	Grab South Quarry	Grab - Across from MSD Lift Station	Fence by Republic Parking Lot	Upper Road by Neck	East Fence Near Flare Station	Fence by Retention Pond
			August - 2012						May - 2013			July - 2014						January - 2015						July - 2015			
			8/16	8/16	8/16	8/17	8/17	8/17	5/7	5/7	5/8	7/29	7/29	7/30	7/30	7/30	7/31	1/27	1/27	1/28	1/28	1/28	1/29	7/28 [3]	7/28	7/29	7/29
Aldehydes/Carbonyl Compounds – Method: EPA TO-11a																											
2,5-Dimethylbenzaldehyde	NA[4]	NA	0.94 [5]	0.91	0.86	-- [6]	--	--	1.2	--	--	--	--	--	--	NS [7]	NS	--	--	--	--	NS	NS	--	--	--	--
Acetaldehyde	5.6	1.3	1.7 [8]	1.5	1.6	10	8.3	1.1	3	2.1	1.7	1.2	1.2	0.87	0.82	NS	NS	1.8	1.8	1.2	1.3	NS	NS	3.0J [9]	2.6J	1.2	1.4J
Benzaldehyde	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	0.6	0.44	1.1	--
Butyraldehyde	NA	NA	--	--	--	--	--	--	0.5	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	1.8	2.4J	1.3	1.7J
Crotonaldehyde, Total	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Formaldehyde	0.94	0.22	6.3	6.2	6.2	--	--	1.5	3	2.6	3.3	2.3	3.1	2.9	2.4	NS	NS	1.8	1.1	1.6	1.9	NS	NS	12	14	4.4	5
Isovaleraldehyde	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
m,p-Tolualdehyde	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
n-Hexaldehyde	NA	NA	--	--	--	--	--	--	0.5	0.4	1.4	0.45	0.36	0.43	0.36	NS	NS	0.44	--	0.48	0.68	NS	NS	--	--	--	--
o-Tolualdehyde	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Propionaldehyde	35	8.3	--	--	--	--	--	--	0.4	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	0.67	--	--	--
Valeraldehyde	NA	NA	0.47	0.62	0.46	--	--	--	--	--	--	--	1.1	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Hydrogen Cyanide – Method: NIOSH 6010																											
Hydrogen Cyanide	3.5	0.83	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS	NS	--	NS	NS	NS	NS	NS	--	NS	NS	NS
Amine Compounds – Method: NIOSH 2010m																											
No Compounds Detected	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Hydrogen Chloride – NIOSH 7903																											
Hydrogen Chloride	88	21	NS	NS	NS	NS	NS	NS	21	--	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sulfur Dioxide – Method: OSHA ID 200																											
Sulfur Dioxide	NA	NA	NS	NS	NS	NS	NS	NS	--	--	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mercury – Method: NIOSH 6009																											
Mercury	1.3	0.31	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS	NS	--	NS	NS	NS	NS	NS	--	NS	NS	NS
Ammonia – Method: *OSHA ID 188*																											
Ammonia	440	100	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Carboxylic Acid Compounds – Method: CAS AQL 102																											
Acetic Acid	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	--	--	--	--	NS	NS	22	--	--	--
Butanoic Acid (Butyric)	NA	NA	--	--	--	--	--	--	--	--	--	--	6.5	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Hexanoic Acid (Caproic)	NA	NA	--	--	--	--	--	--	--	--	--	--	2.8	--	--	NS	NS	--	--	--	--	NS	NS	--	--	--	--
Volatile Organic Compounds (VOCs) – Method: EPA TO15 + TICs – Standard Analyte List																											
1,2,4-Trimethylbenzene	31	7.3	--	--	--	--	--	--	--	--	--	--	6.1	--	--	--	--	<0.73 [10] (0.63J) [11]	--	--	NS	--	--	<0.85UJ [12] (0.9J)	--	--	NS
1,3,5-Trimethylbenzene	NA	NA	--	--	--	--	--	--	--	--	--	--	3.6	--	--	--	--	<0.73 (0.53J)	--	--	NS	--	--	--	--	--	NS
1,3-Butadiene	0.41	0.094	--	--	--	--	--	--	--	--	--	--	38	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
2-Butanone (MEK)	22,000	5,200	--	--	--	--	--	--	--	--	--	1.8J	20	0.73J	1.4J	0.55J	--	0.51J (0.38J)	0.43J	0.84J	NS	2.7J	--	2.1J (2.2J)	2.1J	1.3J	NS
Isopropyl Alcohol	31,000	7,300	--	--	--	--	--	--	--	--	--	1.0J	15J	4.3J	3.5J	--	--	0.79J,B [13] (<0.78)	--	0.73J,B	NS	1.6J,B	--	1.4J (1.9J)	--	0.84J	NS
4-Ethyltoluene	NA	NA	--	--	--	--	--	--	--	--	--	--	12	--	--	--	--	--	--	--	NS	--	--	<0.85 (0.46J)	--	--	NS
4-Methyl-2-pentanone	13,000	3,100	--	--	--	--	--	--	--	--	--	--	55	--	--	--	--	--	--	--	NS	--	--	0.54J (<0.8)	--	--	NS
Acetone	140,000	32,000	17	18	13	11	--	21	18	12	9	9.2	53	8.6	14	8.2J	--	4.7J,B (4.1J,B)	3.9J,B	6.6J	NS	--	2.8J,B	16 (17)	15	10	NS
Acetonitrile	260	63	0.82	--	--	0.88	14	1.9	35	5	4.2	0.83	45	0.71J	2.3	--	--	8.1 (<0.78UJ)	--	--	NS	--	--	0.5J (0.43J)	7.1	0.96	NS
Acrolein	0.088	0.021	--	--	--	--	--	--	--	--	--	--	--	--	0.42J	--	--	0.29J (<0.78)	--	--	NS	--	--	0.58J (0.56J)	0.38J	0.46J	NS
alpha-Pinene	NA	NA	--	--	--	1.1	--	--	1.6	1		--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Benzene	1.6	0.36	10	10	16	11	--	6.1	25	12	0.79	1.7	370	0.35J	1.6	--	--	2.0 (2.3)	0.52J,B	0.98 J,B	NS	2.4	0.87J,B	0.53J (0.55J)	0.38J	0.55J	NS
Carbon Disulfide	3,100	730	--	--	--	--	--	--	--	--	--	--	1.7J	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Carbon Tetrachloride	2	0.47	--	--	--	--	--	--	--	--	--	0.48	--	0.48J	0.51J	0.44J	--	0.49J (0.47J)	0.49J	0.51J	NS	--	--	0.45J (0.45J)	0.45J	0.45J	NS
Chloroethane	44,000	10,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.73 (0.48J)	--	--	NS	--	--	--	--	--	NS
Chloromethane	390	94	--	--	--	--	--	--	--	--	--	0.41J	0.55J	0.5J	0.44J	0.46J	--	0.52J (<0.78)	0.50J	0.56J	NS	0.83J	0.79J	0.26J (0.26J)	0.26J	0.3J	NS
Cumene	1,800	420	--	--	--	--	--	--	--	--	--	--	11	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Cyclohexane	26,000	6,300	--	--	--	--	--	--	--	--	--	--	14	--	--	--	--	<1.5 (1.1J)	--	--	NS	--	--	--	--	--	NS
Dichlorodifluoromethane (CFC 12)	440	100	2.2	2.7	2.3	2.2	2.2	2.3	2.1	2.1	1.9	2.1	2	2.1	2.1	2.1	2.2	2.1 (2.2)	2.3	2.3	NS	2.1	2.2	2.3 (2.3)	2.3	2.3	NS
d-Limonene	NA	NA	0.099	--	--	--	--	--	1.8	1.1	--	--	49	0.22J	0.21J	--	--	--	--	--	NS	--	--	--	--	--	NS
Ethanol	NA	NA	--	--	--	--	12	--	--	7.7	--	6.0J	12J	6J	6.8J	4.6J	--	2.6J (2.1J)	1.7J	7.8	NS	6.0J	--	6.7J (7.2J)	5.9J	6.0J	NS
Ethyl Acetate	310	73	17	5	8.7	--	--	--	--	--	--	9.1	--	5.3	8.7	15	--	1.9 J (1.8)	2.3	1.3J	NS	--	--	9.4 (10)	6.2	3.7	NS
Ethylbenzene	4.9	1.1	0.72	0.83	0.91	--	--	--	1.8	0.97	--	--	140	--	0.27J	--	--	<0.73 (0.40J)	--	0.37J	NS	--	--	<0.85UJ (0.83J)	--	--	NS
m,p-Xylenes	880	200	1.5	1.7	3.2	--	--	--	3.2	1.7	--	--	150	--	0.45J	--	--	0.60J (3.5 J)	--	1.2J	NS	--	--	<1.7UJ (3.3J)	--	--	NS
Methylene Chloride	1,200	100	--	--	--	0.94	0.79	2.1	4	2.6	1.1	0.40J	--	0.58J	0.55J	0.84J	--	0.43J (0.44J)	0.41J	0.63J	NS	--	--	0.48J (0.5J)	0.49J	0.48J	NS
Naphthalene	0.36	0.083	--	--	--	--	--	--	--	--	--	--	0.74J	--	--	--	--	0.50J (<0.78 UJ)	--	--	NS	--	--	<0.85UJ (1.3J)	0.57J	--	NS
n-Butyl Acetate	NA	NA	--	--	--	--	--	--	--	--	--	0.45J	--	--	0.37J	0.73J	--	--	--	--	NS	--	--	--	--	0.29J	NS
n-Heptane	NA	NA	--	--	--	--	--	--	--	--	--	--	40	--	--	--	--	<0.73 J (1.3 J)	--	0.85	NS	--	--	--	--	--	NS
n-Hexane	3,100	730	--	--	--	--	--	--	--	--	--	0.9	34	--	--	--	--	0.66J (1.6 J)	0.46J	1.1	NS	--	--	0.62J (0.59J)	0.45J	0.29J	NS
n-Nonane	880	210	--	--	--	--	--	--	--	0.76	--	--	6.7	--	0.24J	--	--	<0.73 UJ (2.2 J)	--	0.33J	NS	--	--	--	--	--	NS
n-Octane	NA	NA	--	--	--	--	--	--	--	--	--	--	19	--	--	--	--	<0.73 UJ (1.9 J)	--	0.29J	NS	--	--	--	--	--	NS
n-Propylbenzene	4,400	1,000	--	--	--	--	--	--	--	--	--	--	6.2	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
o-Xylene	440	100	--	--	--	--	--	--	--	--	--	--	31	--	--	--	--	<0.73 (0.66J)	--	0.33J	NS	--	--	<0.85 (0.63J)	--	--	NS
Propene	13,000	3,100	1.6	1.8	2	1.8	1.1	2.2	5.9	3.3	0.79	0.87	42	1.8	1.5	0.66J	2.6	1.7 (1.5)	--	1.0	NS	0.84J	--	1.1 (1.3)	0.56J	0.49J	NS
Styrene	4,400	1,000	--	--	--	--	--	--	--	--	--	--	34	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Tetrachloroethene	47	11	--	--	--	--	2.1	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Tetrahydrofuran (THF)	8,800	2,100	2.7	2.6	3	2.5	1.2	2	5.8	3.5		0.76	1.3J	--	0.44J	--	--	--	--	--	NS	--	--	--	0.43J	--	NS
Toluene	22,000	5,200	3.7	3.3	3.4	2	--	2.6	6	3.3	1.5	1.4	500	0.54J	1.4	0.87J	1.9	1.8 J (3.3 J)	0.45J	1.8	NS	0.71J	--	1.7J (4.9J)	1.3	1.1	NS

Table 2: Comprehensive Sampling Events 2012 through 2015 – Bridgeton Landfill

Downwind Comparison of Detected Compounds

Concentration in Ambient Air – All Units µg/m^3

Analyte	Screening Levels		Downwind Perimeter Sample Locations																								
	Ind. RSL [1]	Res. RSL [2]	Pond Center	Pond East	Pond West	East Fence #1	East Fence #2	South Fence	MSD Lift Stn.	Materiologic East End	Northwest Auto Repair	Southeast Corner	East Fence	Retention Pond	East Fence	Republic Fueling	SW Corner of Landfill	Corner of East Fence & Retention Pond	East Fence	Grassy Knoll North of Pipe Staging Area	Grassy Knoll North of Asphalt Plant West of Pipe Staging Area	Grab South Quarry	Grab - Across from MSD Lift Station	Fence by Republic Parking Lot	Upper Road by Neck	East Fence Near Flare Station	Fence by Retention Pond
			August - 2012						May - 2013			July - 2014						January - 2015						July - 2015			
			8/16	8/16	8/16	8/17	8/17	8/17	5/7	5/7	5/8	7/29	7/29	7/30	7/30	7/30	7/31	1/27	1/27	1/28	1/28	1/28	1/29	7/28 [3]	7/28	7/29	7/29
Trichloroethene	0.88	0.21	--	--	--	--	--	--	--	--	**1**	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Trichlorofluoromethane	3,100	730	**1.2**	**1.4**	**1.3**	**1.1**	**1.1**	**1.1**	--	**0.97**	**0.95**	**1.2**	**1.1J**	**2**	**2.3**	**1.7**	--	**1.3 (1.2)**	**1.3**	**1.3**	NS	**1.2J**	**1.3J**	**1.2 (1.2)**	**1.2**	**1.1**	NS
Trichlorotrifluoroethane	130,000	31,000	--	--	--	--	--	--	--	--	--	**0.51J**	--	**0.54J**	**0.55J**	**0.53J**	--	**0.53J (0.49J)**	**0.55J**	**0.50J**	NS	--	--	**0.51J (0.5J)**	**0.5J**	**0.51J**	NS
Vinyl Acetate	880	210	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	**2.3J (1.7J)**	**1.6J**	--	NS
Volatile Organic Compounds (VOCs) –Method: EPA TO15 + TICs - Tentatively Identified Compounds [14]																											
Chlorodifluoromethane	220000	52000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	**4.1**	--	NS
Propane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**3.6**	--	NS	--	--	--	--	--	NS
Isobutane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.9**	NS	--	--	--	--	--	NS
n-butane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**4**	NS	--	--	--	--	--	NS
Isobutene	NA	NA	--	--	**2.9**	--	--	--	--	--	--	--	**510**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Isopentane	NA	NA	--	--	--	--	--	--	--	--	**2.8**	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Isoprene	NA	NA	--	--	--	--	--	--	--	--	--	--	**610**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Ethyl propionate	NA	NA	**14**	**7.1**	**11**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Cyclopentene	NA	NA	--	--	--	--	--	--	--	--	--	--	**76**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Ethyl butyrate	NA	NA	**14**	**8.4**	**11**	**3.9**	--	**4.9**	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
2-butoxyethanol	NA	NA	--	--	--	--	--	--	--	--	--	**15**	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Furan	NA	NA	**3.4**	**4.7**	--	**3.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Dimethylsilanediol	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	**4.8 (5.6)**	**4.7**	--	NS
Dimethyl sulfide	NA	NA	**4.5**	**4.4**	**2.8**	**5.2**	--	**7.5**	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Methylcyclohexane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**-- (4.2)**	--	--	NS	--	--	--	--	--	NS
2-Methylfuran	NA	NA	**3.7**	**5.4**	--	**3.9**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Methylfuran isomer	NA	NA	--	--	--		--	--	**8.8**	**5.3**	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Methylcyclopentene Isomer+1-Butanol	NA	NA	--	--	--	--	--	--	**6.3**	**3.7**	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Acetic Acid	NA	NA	--	**4.7**	--	--	--	--	--	--	--	**4.4**	--	--	--	--	--	--	--	--	NS	--	--	**4.4** (--)	--	--	NS
2-Butanol	NA	NA	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Hexamethylcyclotrisiloxane	NA	NA	**12**	**3.5**	**3.4**	**15**	--	--	--	**4.8**	**8.4**	**5.3**	--	**4**	**16**	**6.7**	--	**-- (4.3)**	--	--	NS	--	--	**34UJB (5.5 ND UJB)**	**11UJB**	**6.1UJB**	NS
n-Octanal	NA	NA	--	--	--	--	--	--	**26**	**7.7**	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
n-Nonanal	NA	NA	--	--	--	--	--	--	**18**	**24**	**5**	--	--	**6.5**	--	**11**	--	**8.4** (--)	--	--	NS	--	--	**3.7 (8.7)**	**7.4**	**3.4**	NS
Trimethylsilanol	NA	NA	--	--	--	--	--	--	--	--	**2.5**	**3**	--	--	**5.1**	--	--	--	--	--	NS	--	--	**26 (5.9)**	**4.3**	**13**	NS
2-Ethylhexylacetate	NA	NA	--	--	--	--	--	--	**18**	**18**	--	--	--	--	--	--	--	--	--	--	NS	--	--	**4.7** (--)	--	--	NS
2-Ethyl-1-hexanol	NA	NA	**3.2**	--	--	--	--	--	**37**	**38**	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
n-Decanal	NA	NA	--	--	--	--	--	--	**10**	**14**	--	--	--	**6.5**	--	--	--	--	--	--	NS	--	--	**-- (8.0)**	**8.4**	--	NS
C5H10 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**160**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C5H10 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**52**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C5H10 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**640**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C5H8 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**69**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C6H12 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**120**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C6H12 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**110**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C6H12 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**130**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C6H12 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**170**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C7H14 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**69**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C8H16 + C7H12 Compounds	NA	NA	--	--	--	--	--	--	--	--	--	--	**120**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C8H16 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**49**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
C7H12 Compound	NA	NA	--	--	--	--	--	--	--	--	--	--	**140**	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
unknown (9.48)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	**7.3 (5.8)**	**3.3**	--	NS
unknown (16.42)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	**3.8** (--)	--	--	NS
unknown siloxane (20.11)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	**6.4** (--)	**4.3**	--	NS
unknown siloxane (21.82)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	**6.7** (--)	**43**	--	NS
unknown siloxane (23.32)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	**51**	--	NS
unknown siloxane (24.93)	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	**20**	--	NS
Unidentified Siloxane	NA	NA	--	--	--	--	--	--	**15**	**6.3**	--	**5.6**	--	**4.7**	**7.4**	**4.7**	--	--	**5.3**	--	NS	--	--	--	--	--	NS
Unidentified Siloxane	NA	NA	--	--	--	--	--	--	**8.7**	**6**	--	**4.1**	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Unidentified Siloxane	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Unidentified Compound	NA	NA	**4.1**	**4**	**3.3**	**3.1**	--	--	**--**	**4.9**	**7.7**	**3.5**	--	--	**5.5**	--	--	--	**3**	--	NS	--	--	--	--	--	NS
Unidentified Compound	NA	NA	--	--	--	--	--	--	--	**4.2**	--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Reduced Sulfur Compound – ASTM D5504																											
Dimethyl sulfide	NA	NA	--	NS	NS	**19**	--	--	--		--	--	--	--	--	--	--	--	--	--	NS	--	--	--	--	--	NS
Polynuclear Aromatic Hydrocarbons - Method: EPA TO13a Modified																											
Acenaphthene	NA	NA	NS	NS	NS	**0.004**	NS	NS	**0.002**	NS	NS	**0.0096**	NS	NS	NS	NS	NS	--	NS	NS	NS	NS	NS	**0.0061 J**	NS	NS	NS
Fluoranthene	NA	NA	NS	NS	NS	**0.0021**	NS	NS	--	NS	NS	**0.0036**	NS	NS	NS	NS	NS	--	NS	NS	NS	NS	NS	**0.0055**	NS	NS	NS
Fluorene	NA	NA	NS	NS	NS	**0.0038**	NS	NS	**0.0017**	NS	NS	**0.013**	NS	NS	NS	NS	NS	--	NS	NS	NS	NS	NS	**0.0097**	NS	NS	NS
Naphthalene	0.36	0.072	NS	NS	NS	**0.029**	NS	NS	**0.024**	NS	NS	**0.056**	NS	NS	NS	NS	NS	**0.047**	NS	NS	NS	NS	NS	**0.023 J**	NS	NS	NS
Phenanthrene	NA	NA	NS	NS	NS	**0.011**	NS	NS	**0.0035**	NS	NS	**0.03**	NS	NS	NS	NS	NS	**0.0036**	NS	NS	NS	NS	NS	**0.023**	NS	NS	NS
Pyrene	NA	NA	NS	NS	NS	--	NS	NS	--	NS	NS	**0.0017**	NS	NS	NS	NS	NS	--	NS	NS	NS	NS	NS	**0.0023**	NS	NS	NS
Polychlorinated Dibenzo-p-Dioxins, Dibenzofurans – EPA Method TO-9A																											
2,3,7,8-TCDD	3.20E-07	6.40E-08	NS	NS	NS	**7.88E-09**	NS	NS	**1.69E-08**	NS	NS	**3.29E-10**	NS	NS	NS	NS	NS	**5.14E-10**	NS	NS	NS	NS	NS	**1.14E-09**	NS	NS	NS

1. United States Environmental Protection Agency Regional Screening Levels for Industrial Air
2. United States Environmental Protection Agency Regional Screening Levels for Residential Air
3. July 2015 PAH samples were collected on 7/31/2015 due to defective Polyurethane Foam sample media.

Table 2: Comprehensive Sampling Events 2012 through 2015 – Bridgeton Landfill

Downwind Comparison of Detected Compounds

Concentration in Ambient Air – All Units $\mu g/m^3$

Analyte	Screening Levels		Downwind Perimeter Sample Locations																								
	Ind. RSL [1]	Res. RSL [2]	Pond Center	Pond East	Pond West	East Fence #1	East Fence #2	South Fence	MSD Lift Stn.	Materiologic East End	Northwest Auto Repair	Southeast Corner	East Fence	Retention Pond	East Fence	Republic Fueling	SW Corner of Landfill	Corner of East Fence & Retention Pond	East Fence	Grassy Knoll North of Pipe Staging Area	Grassy Knoll North of Asphalt Plant West of Pipe Staging Area	Grab South Quarry	Grab - Across from MSD Lift Station	Fence by Republic Parking Lot	Upper Road by Neck	East Fence Near Flare Station	Fence by Retention Pond
			August - 2012						May - 2013			July - 2014						January - 2015						July - 2015			
			8/16	8/16	8/16	8/17	8/17	8/17	5/7	5/7	5/8	7/29	7/29	7/30	7/30	7/30	7/31	1/27	1/27	1/28	1/28	1/28	1/29	7/28 [3]	7/28	7/29	7/29

4. “NA” = Not Available
5. Bold indicates that compound concentration was detected above laboratory reporting limits.
6. “--”: Compound not detected
7. “NS” = Not Sampled
8. Shading indicates that the detected concentration exceeds the United States Environmental Protection Agency Regional Screening Level for **Residential Air** or **Industrial Air.**
9. J = The result is an estimated concentration that is less than the MRL but great than or equal to the Method Detection Limit (MDL).
10. “<”: Compound concentration not detected above Method Reporting Limit (MRL). This are presented only with duplicate samples.
11. Values in parenthesis are for duplicate sample concentrations.
12. UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
13. B = Compound detected in Trip Blank or Laboratory Method Blank
14. Tentatively Identified compounds – under EPA Method TO-15 + TICs, the reported concentrations are estimated. Retention times for unknown compounds are presented in parentheses

NOTE: Trip Blanks were analyzed for each analyte. Analytical results for compounds detected in any trip blank have been amended with applicable data qualifiers.

Table 3: Comprehensive Sampling Events 2012 through 2015 - Bridgeton Landfill Onsite Comparison of Detected Compounds Concentration in Ambient Air – All Units µg/m^3																				
Analyte	Screening Levels			Upwind Perimeter Sample Locations																
	Ind. RSL [1]	OSHA PELs [2]	ACGIH TLVs [3]	2nd Tier	Amphitheater	East Face	Amphitheater	2nd Tier	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry
				August-2012			April/May-2013		July-2014				January-2015				July-2015			
				8/16/12	8/16/12	8/17/12	4/16/15	5/8/13	7/29/14	7/29/14	7/30/14	7/30/14	1/27/15	1/27/15	1/28/15	1/28/15	7/28/15	7/28/15	7/29/15	7/29/15
Aldehydes/Carbonyl Compounds – Method: EPA TO-11a																				
2,5-Dimethylbenzaldehyde	NA [4]	NA	NA	**0.9** [5]	-- [6]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetaldehyde	5.6	360,000	45,000	**1.5**	**19** [7]	**1.5**	**4.4**	**3.1**	**1.3**	**0.78**	**0.91**	**0.88**	**2.3**	**1.8**	**1.1**	**1.5**	**2.3J** [8]	**2.3J**	**1.7J**	**1.2**
Benzaldehyde	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.43**	**0.36**	--	--
Butyraldehyde	NA	NA	NA	--	--	--	--	**0.49**	--	--	--	--	--	--	--	--	**2.0J**	**2.3J**	**1.7**	**1.8**
Formaldehyde	0.94	1,000	400	**6.1**	--	**1.7**	**1.8**	**3.9**	**2.5**	**2.5**	**2.9**	**2.8**	**1.2**	**1.1**	**1.3**	**1.5**	**12**	**13**	**4.9**	**4.7**
n-Hexaldehyde	NA	NA	NA	--	--	--	--	**1**	**0.65**	**0.37**	--	--	**0.68**	**0.45**	**0.55**	**0.48**	--	--	**0.55**	**0.38**
Propionaldehyde	3.5	NA	47,500	--	--	--	--	**0.41**	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Cyanide – Method: NIOSH 6010																				
Hydrogen Cyanide	3.5	11,000	5,000	--	--	--	--	--	--	--	--	NS [9]	--	--	--	--	--	--	--	--
Amine Compounds – Method: NIOSH 2010m																				
No Compounds Detected	*NA*	*NA*	*NA*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Chloride – NIOSH 7903																				
Hydrogen Chloride	8.8	7,000	3,000	NS	NS	NS	**1.8ug**	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sulfur Dioxide – Method: OSHA ID 200																				
Sulfur Dioxide	NA	13,000	NA	NS	NS	NS	--	--	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mercury – Method: NIOSH 6009																				
Mercury	1.3	100	25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia – Method: *OSHA ID 188*																				
Ammonia	440	35,000	17,500	--	--	--	--	--	**130**	--	--	--	--	--	--	--	--	--	--	--
Carboxylic Acid Compounds – Method: CAS AQL 102																				
Acetic Acid	NA	25,000	27,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**-- (25J)**	--	**23**
Hexanoic Acid (Caproic)	NA	NA	NA	--	--	--	--	**11**	--	--	--	--	--	--	--	--	--	--	--	--
Pentanoic Acid (Valeric)	NA	NA	NA	--	--	--	--	**4.4**	--	--	--	--	--	--	--	--	--	--	--	--
Butanoic Acid (Butyric)	NA	NA	NA	--	--	--	--	**12**	--	--	--	--	--	**4.2 (4.0)** [10]	--	--	--	**-- (2.7J)**	--	--
Propionic Acid (Propanoic)	NA	NA	NA	--	--	--	--	**5.6**	--	--	--	--	--	**-- (3.1)**	--	--	--	--	--	--
Volatile Organic Compounds (VOCs) – Method: EPA TO15 + TICs – Standard Analyte List																				
1,2,4-Trimethylbenzene	31	NA	NA	--	--	--	--	**2.4**	--	**0.32**	--	--	--	--	**0.18J**	**0.30J**	--	--	--	--
1,2-Dichloroethane	0.47	200,000	40,000	--	--	--	--	**--**	--	--	--	--	--	--	--	--	**170D**	--	--	--
1,4-Dichlorobenzene	1.1	450,000	60,000	--	--	--	--	**2.4**	--	--	--	--	--	--	--	--	--	**0.27J**	--	--
1,4-Dioxane	2.5	360,000	72,000	--	--	--	--	--	--	--	--	--	--	--	--	--	**700D**	**0.26J**	--	--
2-Butanone (MEK)	22,000	590,000	590,000	--	--	**11**	**32**	**9.5**	**1.1**	**3.3**	**0.92**	**0.8**	--	**2.5J**	**1.2J**	**0.42J**	**2.1J**	**3.0J**	**1.5J**	**1.1J**
4-Methyl-2-pentanone	NA	NA	NA	--	--	--	**2.1**	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropyl Alcohol	31,000	980,000	490,000	--	--	--	**38**	--	**1.9**	**2.2**	**1.7**	**1.6**	--	**1.2J**	**2.1J**	--	**2.6J**	**0.92J**	**4.2J**	**1.2J**
Acetone	140,000	2,400,000	1,200,000	**13**	**14**	**19**	**66**	**18**	**10**	**17**	**10**	**8.8**	**4.4J**	**6.7J**	**8.7**	**4.1J**	**15**	**17**	**14**	**9.5J**
Acetonitrile	260	70,000	35,000	--	**0.76**	--	--	**5.4**	**2.6**	**1.4**	**0.43**	**11**	**9.1**	**0.8**	**0.95**	--	**1.1**	**1.8**	**7.0**	**0.43J**
Acrolein	0.088	250	250	--	--	--	--	--	--	**0.81**	**0.43**	**0.31**	--	--	**0.30J**	--	**1.7J**	**0.42J**	**0.38J**	--
alpha-Pinene	NA	550,000	100,000	--	--	--	**1.4**	**0.9**	--	--	--	--	--	--	**0.42J**	--	--	--	--	--
Benzene	1.6	32,000	1,600	--	**1.1**	**6.2**	**27**	**9.7**	**0.42**	**0.71**	**0.47**	**0.28**	**0.60J**	**0.55J**	**1.8 J,B** [11]	**0.8 J,B**	**0.49J**	**0.52J**	**0.37J**	--
Carbon Disulfide	3,100	60,000	3,000	--	--	--	--	--	--	**0.27**	--	--	--	--	--	--	--	--	**0.31J**	--
Carbon Tetrachloride	2	30,000	15,000	--	--	--	--	--	**0.47**	**0.51**	**0.43**	**0.5**	**0.49J**	**0.50J**	**0.51J**	**0.53J**	**0.44J**	**0.45J**	**0.44J**	**0.46J**
Chloromethane	390	200,000	100,000	--	--	--	--	--	**0.36**	**0.36**	**0.37**	**0.43**	**0.54J**	**0.45J**	**0.37J**	**0.50J**	**0.24J**	**0.27J**	**0.27J**	--
Cyclohexane	26,000	1,050,000	350,000	--	--	--	--	--	--	**0.58**	--	--	--	**0.75J**	**0.70J**	**0.40J**	--	--	--	--
Dichlorodifluoromethane (CFC 12)	440	4,950,000	4,950,000	**2.2**	**2.1**	**2.2**	**2.1**	**2.1**	**2.1**	**2.2**	**2**	**2.1**	**2.1**	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.4**
d-Limonene	NA	NA	NA	--	--	--	**1.3**	**1.7**	**0.44**	**0.54**	--	--	--	**0.20J**	**1.4**	--	**0.37J**	--	**0.66J**	--
Ethanol	NA	1,900,000	1,900,000	--	**16**	**8.5**	**58**	**11**	**7.8**	**18**	**6.6**	**7.2**	**3.0J**	**9.1**	**20**	**3.5J**	**6.8J**	**8.0**	**27**	**10J**
Ethyl Acetate	310	1,400,000	1,400,000	**8**	**3.1**	**1.6**	**4.9**	**--**	**11**	**9.3**	**5.1**	**9.9**	**2.4**	**11**	**74**	**1.2J**	**4.6**	**4.2**	**3.2**	**3.3**
Ethylbenzene	4.9	435,000	87,000	--	--	--	**2**	**1.9**	--	**0.48**	--	--	--	--	**0.20J**	--	--	--	--	--
m,p-Xylenes	880	870,000	870,000	--	--	--	**3.9**	**3.7**	--	**1**	--	--	--	--	**0.75J**	**1.1J**	**0.48J**	--	--	--

Table 3: Comprehensive Sampling Events 2012 through 2015 - Bridgeton Landfill
Onsite Comparison of Detected Compounds
Concentration in Ambient Air – All Units µg/m³

Analyte	Screening Levels			Upwind Perimeter Sample Locations																
	Ind. RSL [1]	OSHA PELs [2]	ACGIH TLVs [3]	2nd Tier	Amphitheater	East Face	Amphitheater	2nd Tier	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry
				August-2012			April/May-2013		July-2014				January-2015				July-2015			
				8/16/12	8/16/12	8/17/12	4/16/15	5/8/13	7/29/14	7/29/14	7/30/14	7/30/14	1/27/15	1/27/15	1/28/15	1/28/15	7/28/15	7/28/15	7/29/15	7/29/15
Methylene Chloride	1,200	85,000	170,000	--	--	**0.88**	**1.8**	**0.73**	**2.8**	**1.8**	**0.69**	**0.93**	**0.59J**	**0.93**	**0.63**	**0.38J**	**0.44J**	**0.43J**	**0.90**	**0.72J**
n-Butyl Acetate	NA	710,000	710,000	--	--	--	**1.6**	**1.1**	--	**0.61**	**0.45**	--	**0.71J**	--	**0.32J**	--	--	**0.39J**	**0.3J**	--
n-Heptane	NA	2,000,000	1,600,000	--	--	--	--	--	--	**0.51**	--	--	**0.38J**	**0.25J**	**0.64**	**0.48J**	--	--	--	--
n-Hexane	3,100	1,800,000	180,000	--	--	--	--	--	**1.5**	**1.6**	**0.23**	--	**0.77J**	**0.9**	**2.5**	**0.94**	**0.43J**	**0.43J**	**0.59J**	--
n-Nonane	880	NA	NA	--	--	--	**1.1**	**1**	**0.67**	**0.73**	--	--	--	--	**0.27J**	**0.62J**	--	--	**0.27J**	--
n-octane	NA	2,350,000	1,400,000										--	--	**0.28J**	**0.43J**	--	--	--	--
Naphthalene	0.36	50,000	50,000	--	--	--	--	**1.5**	--	--	--	--	--	--	--	--	--	**0.52J**	--	--
o-Xylene	440	435,000	435,000	--	--	--	**1.1**	**1.4**	--	**0.36**	--	--	--	--	**0.23J**	**0.27J**	--	--	--	--
Propene	13,000	NA	NA	--	--	**1.8**	**14**	**2.1**	**0.84**	**1.6**	**0.66**	**1.1**	--	**0.62J**	**1.3**	--	**1.8**	**0.87**	**2.6**	**1.0J**
Styrene	4,400	400,000	85,000	--	--	--	--	--	--	**0.22**	--	--	--	--	--	--	**0.26J**	--	--	--
Tetrachloroethene	47	680,000	170,000										--	--	**0.30J**	--	--	--	--	--
Tetrahydrofuran (THF)	8,800	590,000	147,500	--	--	**4.7**	**27**	**4.7**	--	**0.32**	--	--	--	**0.36J**	--	--	--	**0.97**	--	--
Toluene	22,000	750,000	75,000	**1.7**	**1.6**	**1.6**	**8.8**	**3.6**	**4.1**	**10**	**0.67**	**0.69**	**0.97J**	**5.6**	**5.9**	**1.3**	**1.4**	**1.1**	**1.2**	**0.81J**
Trichloroethene	0.88	500,000	50,000	--	--	--	--	**0.98**	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	3,100	5,600,000	5,600,000	**1.3**	**1.1**	**1.1**	**1.2**	**1**	**1.3**	**2**	**1.6**	**1.6**	**1.3**	**1.3**	**1.2**	**1.3**	**1.2**	**1.2**	**1.1**	**1.1J**
Trichlorotrifluoroethane	130,000	7,600,000	7,600,000	--	--	--	--	--	**0.53**	**0.55**	**0.47**	**0.57**	**0.51J**	**0.50J**	**0.47J**	**0.53J**	**0.51J**	**0.5J**	**0.51J**	**0.49J**
Vinyl Acetate	880	NA	35,000	--	--	--	--	--	--	--	--	--	--	--	--	--	**2.0J**	**1.7J**	**1.1J**	--
Volatile Organic Compounds (VOCs) –Method: EPA TO15 + TICs - Tentatively Identified Compounds [12]																				
1,1-Difluoroethane	180,000	NA	NA	--	--	--	--	--	--	--	--	--	--	--	**21**	--	--	--	--	--
Chlorodifluoromethane	220,000	NA	350,000	--	--	--	--	--	--	--	--	--	--	--	**8.5**	--	--	--	--	**5.1**
Propane	NA	NA	NA	--	--	--	--	--	**23**	--	--	--	**9.8**	--	**4.6**	**4.1**	--	--	--	--
Acetaldehyde	5.6	1.3	360,000	--	--	--	--	--	--	--	--	--	--	--	--	--	**4.8**	--	--	--
Isobutane	NA	NA	NA	--	--	--	**10**	--	--	**3.1**	--	--	--	**3.7**	**4.1**	--	--	--	--	--
Isobutene	NA	NA	NA	--	--	--	**6.9**	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopentane	NA	NA	NA	--	**4.9**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butane	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	**3.5**	**2.9**	--	--	--	--
unknown (9.48)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**4.7**	--	**5.8**
Trimethylsilanol	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**8.5**	**5.1**	--	**12**
1,1-Dimethoxyethane	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**9.6**	--	--	--
1,3-Dioxolane	NA	NA	60,000	--	--	--	--	--	--	--	--	--	--	--	--	--	**10**	--	--	--
Bis(2-Chloroethoxy)Methane	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**190**	--	--	--
n-Pentane	4,400	2,950,000	2,950,000	--	--	--	**7.1**	--	--	**4.4**	--	--	--	**4.6**	**4.4**	--	--	--	--	--
1-Propanol	NA	NA	250,000	--	--	--	--	--	--	**3.4**	--	--	--	--	--	--	--	--	--	--
Ethyl propionate	NA	NA	NA	**9.9**	**4.1**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl butyrate	NA	NA	NA	**9.7**	**5.9**	**4.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-butoxyethanol	NA	NA	NA	**2.8**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Furan	NA	NA	NA	--	--	**13**	**26**	**7**	--	--	--	--	--	--	--	--	--	--	--	--
Dimethylsilanediol	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**5.1**	**7.1**	--	--
Dimethyl sulfide	NA	NA	25,400	--	--	**12**	**34**	**12**	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Ether	NA	NA	NA	--	--	--	**6.7**	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl acetate	NA	NA	NA	--	--	**10**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl hexanoate	NA	NA	NA	--	--	--	--	**6.6**	--	--	--	--	--	--	--	--	--	--	--	--
Bromotrifluoromethane	NA	6,090,000	6,090,000	--	--	--	**5.4**	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Butanediol	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**39**	--	--	--
(E,E)-2,4-hexadienal	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**9.5**	--	--	--
1,2,3-Trichloropropane	1.3	300,000	30	--	--	--	--	--	--	--	--	--	--	--	--	--	**270**	--	--	--
2-Methylfuran	NA	NA	NA	--	--	**14**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylfuran isomer	NA	NA	NA	--	--	--	**9.7**	**3.9**	--	--	--	--	--	--	--	--	--	--	--	--
Methyl propionate	NA	NA	NA	--	--	**5.5**	**9.9**	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl butyrate	NA	NA	NA	--	--	**12**	**13**	**11**	--	--	--	--	--	--	--	--	--	--	--	--

Table 3: Comprehensive Sampling Events 2012 through 2015 - Bridgeton Landfill
Onsite Comparison of Detected Compounds
Concentration in Ambient Air – All Units μg/m^3

Analyte	Screening Levels			Upwind Perimeter Sample Locations																
	Ind. RSL [1]	OSHA PELs [2]	ACGIH TLVs [3]	2nd Tier	Amphitheater	East Face	Amphitheater	2nd Tier	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry
				August-2012			April/May-2013		July-2014				January-2015				July-2015			
				8/16/12	8/16/12	8/17/12	4/16/15	5/8/13	7/29/14	7/29/14	7/30/14	7/30/14	1/27/15	1/27/15	1/28/15	1/28/15	7/28/15	7/28/15	7/29/15	7/29/15
2-Butanol	NA	455,000	303,000	--	--	--	**15**	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexamethylcyclotrisiloxane	NA	NA	NA	--	--	--	--	--	**5.9**	**3.2**	**2.8**	**3.7**	--	--	--	--	**5.5UJ [13] B**	**10UJB**	**5.1UJB**	**7.4UJB**
n-Octanal	NA	NA	NA	--	--	--	--	**3.6**	--	**4.8**	--	--	--	--	--	--	--	--	--	--
n-Nonanal	NA	NA	NA	--	--	--	**10**	**17**	**9.6**	**11**	**7.2**	**7.7**	--	**2.8**	**2.6**	--	--	**11**	**4.0**	--
p-Cymene	NA	NA	NA	--	--	--	--	**14**	--	--	--	--	--	--	--	--	--	--	--	--
n-Undecane	NA	NA	NA	--	--	--	--	**9.9**	--	--	--	--	--	--	--	--	--	--	--	--
n-Dodecane	NA	NA	NA	--	--	--	--	**5.3**	--	--	--	--	--	--	--	--	--	--	--	--
Trimethylsilanol	NA	NA	NA	--	--	--	--	--	**5.6**	**7.5**	--	**3.1**	--	--	--	--	--	--	--	--
2-Ethylhexylacetate	NA	NA	NA	--	--	--	--	**3.4**	--	--	--	--	--	--	--	--	--	--	--	--
1-Butanol	NA	300,000	60,000	--	--	--	**17**	**6.1**	--	**4**	--	--	--	--	--	--	--	**4.3**	--	--
2-Ethylhexylacetate	NA	NA	NA	--	--	--	--	--	**6.3**	--	--	--	--	--	**4.6**	--	--	--	--	--
2-Ethyl-1-hexanol	NA	NA	NA	--	--	--	**5.6**	**14**	--	--	--	--	--	--	--	--	--	--	--	--
n-Decanal	NA	NA	NA	--	--	--	**5.5**	**8.1**	**9.2**	**7.7**	**4.7**	**5.4**	--	--	--	--	--	**9.2**	**3.9**	--
C6-C10 Alkene (13.0 RT)	NA	NA	NA	--	--	**4.6**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C13H28 Branched Alkane	NA	NA	NA	--	--	--	--	--	--	**3.1**	--	--	--	--	--	--	--	--	--	--
unknown siloxane (20.11)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**4.4**	--	--
unknown (20.24)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**13**	--	--	--
2-Ethyl-1-hexanol	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**4.4**	--	--
unknown (20.91)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**6.5**	--	--	--
unknown (21.16)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**6.2**	--		--
Bis(2-chloroethyl) ether	0.037	90,000	30,000	--	--	--	--	--	--	--	--	--	--	--	--	--	**28**	--	--	--
unknown siloxane (21.82)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**48**	--	**4.8**
unknown (22.62)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	**13**	--	--	--
unknown siloxane (23.32)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**49**	--	--
unknown siloxane (24.93)	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**14**	--	--
Unidentified Siloxane	NA	NA	NA	--	--	--	--	--	**5.6**	**13**	--	**4.7**	--	**3.2**	**3.4**	--	--	--	--	--
Unidentified Compound	NA	NA	NA	--	--	--	--	**3.3**	--	**2.7**	**4.1**	--	--	--	--	--	--	--	--	--
Reduced Sulfur Compound – ASTM D5504																				
Dimethyl disulfide	NA	NA	NA	--	--	--	**26**	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfide	NA	NA	NA	--	--	**33**	**37**	--	--	--	--	--	--	--	--	--	--	--	--	--
Polynuclear Aromatic Hydrocarbons - Method: EPA TO13a Modified																				
Acenaphthene	NA	NA	NA	**0.0076**	NS	NS	**0.013**	NS	**0.01**	NS	NS	NS	--	NS	NS	NS	**0.0062 J**	NS	NS	NS
Fluoranthene	NA	NA	NA	**0.004**	NS	NS	**0.005**	NS	**0.0042**	NS	NS	NS	--	NS	NS	NS	**0.006**	NS	NS	NS
Fluorene	NA	NA	NA	**0.0089**	NS	NS	**0.014**	NS	**0.013**	NS	NS	NS	--	NS	NS	NS	**0.0086**	NS	NS	NS
Naphthalene	0.36	50,000	50,000	**0.089**	NS	NS	**0.13**	NS	**0.035**	NS	NS	NS	**0.049**	NS	NS	NS	**0.023 J**	NS	NS	NS
Phenanthrene	NA	NA	NA	**0.023**	NS	NS	**0.024**	NS	**0.032**	NS	NS	NS	**0.0041**	NS	NS	NS	**0.021**	NS	NS	NS
Pyrene	NA	NA	NA	**0.002**	NS	NS	**0.003**	NS	**0.0019**	NS	NS	NS	--	NS	NS	NS	**0.0026**	NS	NS	NS
Polychlorinated Dibenzo-p-Dioxins, Dibenzofurans – EPA Method TO-9A																				
2,3,7,8-TCDD	3.20E-07	NA	NA	**1.49E-08**	NS	NS	**6.31E-09**	NS	**3.12E-10**	NS	NS	NS	**5.88E-10**	NS	NS	NS	**1.58E-08**	NS	NS	NS

1. United States Environmental Protection Agency Regional Screening Levels for Industrial Air
2. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit.
3. American Conference of Governmental Industrial Hygienists – Threshold Limit Value.
4. "NA" = Not Available
5. Bold indicates that compound concentration was detected above laboratory reporting limits.
6. "--": Compound not detected
7. Shading indicates that the detected concentration exceeds the United States Environmental Protection Agency Regional Screening Level for ***Industrial Air.***
8. J = The result is an estimated concentration that is less than the MRL but great than or equal to the Method Detection Limit (MDL).
9. "NS" = Not Sampled

Table 3: Comprehensive Sampling Events 2012 through 2015 - Bridgeton Landfill
Onsite Comparison of Detected Compounds
Concentration in Ambient Air – All Units $\mu g/m^3$

Analyte	Screening Levels			Upwind Perimeter Sample Locations																
	Ind. RSL [1]	OSHA PELs [2]	ACGIH TLVs [3]	2nd Tier	Amphitheater	East Face	Amphitheater	2nd Tier	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry	Flare Station	South Quarry	Neck	North Quarry
				August-2012			April/May-2013		July-2014				January-2015				July-2015			
				8/16/12	8/16/12	8/17/12	4/16/15	5/8/13	7/29/14	7/29/14	7/30/14	7/30/14	1/27/15	1/27/15	1/28/15	1/28/15	7/28/15	7/28/15	7/29/15	7/29/15

10. Values in parenthesis are for duplicate sample concentrations.
11. B = Compound detected in Trip Blank or Laboratory Method Blank
12. Tentatively Identified Compounds – under Method: EPA TO15 + TICs. The reported concentrations for TICs are estimated. Retention time is located in parentheses next to unknown compounds and identical compounds with different retention times.
13. UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

NOTE: Trip Blanks were analyzed for each analyte. Analytical results for compounds detected in any trip blank have been amended with applicable data qualifiers.

Table 4 - Comprehensive Sampling Events 2012 Through 2015 - Bridgeton Landfill
Source Gas Comparison Table
Detected Compound Concentrations in Source Gas - All Units $\mu g/m^3$

Analyte	Sample Locations																	
	Amphitheater	Second Tier	East Face	Amphitheater	Second Tier	East Face	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry [1]	South Quarry	Flare Inlet (A / B) [2]
	August - 2012			April/May - 2013			July - 2014				January - 2015				July - 2015			
Aldehydes/Carbonyl Compounds – Method: EPA TO-11a																		
Acetaldehyde	1,200	-- [3]	350	3,400	120	--	64	49	1,600	3,000	64	45	130	9,500	51	--	490J [4]	13,000J
Benzaldehyde	2,300	140	990	2,100	--	--	--	--	270	3,100	--	--	--	--	--	--	1,500	3,000
Butyraldehyde	3,000	--	1,500	6,000	1,100	560	--	--	10,000	6,900	2	--	480	23,000	--	--	5,000J	24,000J
Propionaldehyde	660	--	140	1,700	180	280	--	--	1,300	1,700	--	--	59	6,100	--	--	660J	6,100J
Isovaleraldehyde	--	120	--	340	--	--	--	--	--	--	--	--	--	26,000	--	--	--	--
m,p-Tolualdehyde	--	--	--	5,500	21,000	--	--	--	--	4,000	--	--	4,200	6,800	--	--	--	--
n-Hexaldehyde	--	--	--	1,700	--	840	--	--	450	--	--	--	--	95	--	--	--	--
2,5-Dimethylbenzaldehyde	720	--	960	--	--	--	--	--	110	--	--	--	--	--	--	--	--	--
Formaldehyde	--	--	--	--	--	--	--	--	--	78	--	--	--	--	--	--	--	--
o-Tolualdehyde	--	340	92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Valeraldehyde	--	1,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury – Method: NIOSH 6009																		
Mercury	--	--	--	--	--	--	--	--	--	70	--	--	--	480	--	--	--	63
Carboxylic Acid Compounds – Method: CAS AQL 102																		
2-Ethylhexanoic Acid	4,800	--	1,800	1,300	480	1,000	--	--	260	18,000	--	--	--	--	--	--	2,000J	5,900J
2-Methylbutanoic Acid	--	--	--	17,000	51,000	19,000	--	--	12,000	25,000	--	--	2,200	49,000	--	--	17,000J	23,000J
2-Methylpentanoic Acid	--	--	--	1,900	--	950	--	--	1,700	4,700	--	--	160	4,000	--	--	3,100J	3,200J
2-Methylpropanoic Acid (Isobutyric)	--	--	--	46,000	170,000	73,000	--	--	40,000	88,000	--	--	9,300	110,000	--	--	39,000J	51,000J
2-Methylpropionic Acid	12,000	--	13,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylbutanoic Acid (Isovaleric)	11,000	--	9,000	28,000	89,000	34,000	--	--	20,000	41,000	--	--	3,200	80,000	--	--	29,000J	36,000J
3-Methylpentanoic Acid	610	--	--	350	--	--	--	--	340	2,900	--	--	--	--	--	--	720J	800J
4-Methylpentanoic Acid (Isocaproic)	1,100	--	--	2,000	--	--	--	--	800	6,800	--	--	--	--	--	--	1,400J	--
Acetic Acid	11,000	--	--	94,000	99,000	53,000	--	--	35,000	100,000	--	--	13,000	210,000	--	--	37,000J	83,000J
Benzoic Acid	--	--	--	--	--	--	--	--	150	1,200	--	--	--	--	--	--	--	--
Butanoic Acid (Butyric)	56,000	--	41,000	290,000	590,000	200,000	--	--	200,000	750,000	--	170	24,000	800,000	--	--	150,000J	370,000J
Heptanoic Acid (Enanthoic)	2,900	--	--	3,600	290	320	--	--	--	25,000	--	--	--	--	--	--	260	6,500J
Hexanoic Acid (Caproic)	53,000	--	1,200	110,000	15,000	13,000	--	--	10,000	440,000	--	--	650	130,000	--	--	23,000J	120,000J
Nonanoic Acid (Pelargonic)	--	--	--	--	--	--	--	--	--	1,000	--	--	--	--	--	--	--	220
Octanoic Acid (Caprylic)	690	--	--	320	--	--	--	--	--	15,000	--	--	--	--	--	--	--	2,600
Pentanoic Acid (Valeric)	23,000	--	3,800	84,000	58,000	24,000	--	--	28,000	220,000	--	--	2,200	200,000	--	--	33,000J	110,000J
Propionic Acid (Propanoic)	13,000	--	9,200	100,000	140,000	89,000	--	--	41,000	150,000	--	--	11,000	180,000	--	--	34,000J	95,000J
Volatile Organic Compounds (VOCs) – Method: EPA TO15 – Standard Analyte List																		
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	1.1J	--	--	--	--	--	--
1,2-Dichloroethane	--	--	--	--	--	--	--	--	4,200J	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	19,000	--	8,300	5,100	--	3,800	380	860	75,000	95,000	230	3.4	3,800	4,000J	82	13	28,000	26,000 / 35,000
1,2-Dichloro-1,1,2,2-tetrafluoroethane	--	--	--	--	--	--	--	43J	--	--	--	28	--	--	67	130	--	--
1,3,5-Trimethylbenzene	6,700	--	3,500	--	--	--	810	970	29,000	29,000	720	2.7	1,200	1,500J	360	3.8	8,800	7,900 / 10,000
1,3-Butadiene	590	--	--	3,800	--	4,000	210J	150	8,100J	6,900	430	8.1	740	3,400J	66	--	1,200J	2,100J / 3,200J
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19J	2.5	--	--
1,4-Dichlorobenzene	10,000	--	3,200	--	--	--	2,100	180	21,000	68,000	900	1.7	1,600	2,200J	3,300	2.4	14,000	22,000 / 31,000
1,4-Dioxane	4,100	--	--	5,400	--	--	--	--	--	27,000	--	--	290J	5,300	--	--	2,600	21,000 / 26,000
2-Butanone (MEK)	340,000	--	89,000	440,000	1,300,000	91,000	--	--	2,300,000	1,400,000	--	3.8J	27,000	600,000	77J	19	260,000	660,000 / 930,000
2-Hexanone	11,000	--	3,100	9,500	17,000	--	--	--	48,000	38,000	--	--	720	6,700	--	--	13,000	20,000 / 26,000
2-Propanol (Isopropyl Alcohol)	60,000	--	--	110,000	480,000	--	--	--	1,600,000	590,000	--	--	12,000	140,000	--	--	31,000	320,000 / 400,000
4-Ethyltoluene	4,900	--	2,900	--	--	--	300	340	31,000	26,000	240	1.2J	1,000	1,600J	150	3.4	8,500	7,600 / 10,000

Table 4 - Comprehensive Sampling Events 2012 Through 2015 - Bridgeton Landfill
Source Gas Comparison Table
Detected Compound Concentrations in Source Gas - All Units µg/m^3

Analyte	Sample Locations																	
	Amphitheater	Second Tier	East Face	Amphitheater	Second Tier	East Face	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry [1]	South Quarry	Flare Inlet (A / B) [2]
	August - 2012			April/May - 2013			July - 2014				January - 2015				July - 2015			
4-Methyl-2-pentanone	30,000	--	16,000	15,000	140,000	5,100	--	--	160,000	72,000	--	--	2,100	18,000	--	9.4	30,000	31,000 / 42,000
Acetone	500,000	--	72,000	600,000	980,000	88,000	940J	--	2,600,000	2,000,000	470J	9.9 J,B [5]	31,000	930,000	2,500	--	260,000	1,100,000 / 1,500,000
Acetonitrile	--	--	--	--	--	--	120J	190	--	--	--	--	--	--	--	--	--	--
alpha-Pinene	12,000	53,000	16,000	6,400	180,000	5,700	2,800	570	380,000	100,000	2,600	5.6	7,700	11,000	1,200	15	44,000	19,000 / 25,000
Benzene	120,000	620,000	390,000	370,000	2,000,000	360,000	40,000	9,200	1,500,000	880,000	12,000	12	87,000	460,000	1,200	28	150,000	320,000 / 450,000
Carbon Disulfide	--	--	--	--	--	--	--	--	--	2,000	--	12J	--	--	38J	--	760J	1,200J / 1,700J
Chlorobenzene	3,000	--	--	--	--	--	1,100	2,700	7,700J	6,200	860	4.2	220J	--	92	--	1,800	2,400J / 3,400J
Chloroethane	--	5600	--	--	--	--	--	--	6,500J	4,900	--	8.5	390J	2,500J	--	10	--	1,600J / 2,300J
Chloroform	--	--	--	--	--	--	--	--	--	--	--	1.1J	--	--	--	38	--	--
Chloromethane	--	--	2,700	7,100	--	8,200	--	--	20,000	16,000	60J	--	480J	10,000	--	--	4,100	6,100 / 8,400
cis-1,2-Dichloroethene	--	--	--	--	--	--	--	53	--	--	--	1.1J	--	--	--	27	--	--
Cumene	6,000	5,200	4,300	--	19,000	--	750	730	43,000	29,000	120	2	1,200	2,800J	280	--	11,000	8,500 / 11,000
Cyclohexane	1,100	--	--	--	--	--	560	410	--	--	310	140	--	--	400	100	--	--
Dichlorodifluoromethane (CFC 12)	--	--	--	--	--	--	110	92	--	--	88J	140	--	--	190	1,400	--	--
d-Limonene	22,000	22,000	21,000	4,000	46,000	6,700	580	--	300,000	200,000	530	1.8	12,000	8,300	--	9	81,000	50,000 / 67,000
Ethanol	99,000	--	--	290,000	--	--	--	--	510,000	1,800,000	--	--	4,700J	500,000	--	19	5,200J	1,200,000 / 1,500,000
Ethyl Acetate	4,800	--	--	29,000	120,000	--	--	--	250,000	280,000	--	--	--	130,000	--	--	38,000 M1	120,000 / 180,000
Ethylbenzene	27,000	32,000	22,000	18,000	160,000	16,000	2,400	1,700	200,000	120,000	640	3.4	5,000	19,000	150	11	38,000	38,000 / 51,000
m,p-Xylenes	57,000	37,000	40,000	31,000	260,000	21,000	5,100	4,000	390,000	220,000	2,100	6.8	9,400	31,000	410	27	62,000	66,000 / 88,000
Methyl tert-Butyl Ether	--	--	--	--	--	--	210	110	--	1,800J	110J	--	--	--	100	--	1,300J	--
Methylene Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	56J	--	--	--
Naphthalene	510	--	--	--	--	--	--	--	--	2,900J	--	--	--	--	--	5.1	--	2,200J / 2,600J
n-Butyl Acetate	12,000	--	--	25,000	54,000	--	--	--	200,000	230,000	--	--	1,100	42,000	--	11	27,000	81,000 / 110,000
n-Heptane	3,200	8,000	3,300	5,300	13,000	6,000	1,100	850	--	--	640	56	800	4,200	460	85	3,400	3,800J / 5,800
n-Hexane	2,100	--	2,900	4,200	--	7,600	1,600	930	11,000	6,400	1,100	100	950	4,100J	1,100	260	3,600	4,400 / 6,000
n-Nonane	16,000	17,000	9,000	8,600	76,000	5,900	850	820	110,000	60,000	1,100	1.6J	2,600	8,300	220	7	17,000	16,000 / 20,000
n-Octane	9,500	17,000	13,000	12,000	59,000	10,000	2,500	1,400	58,000	36,000	1,300	4.9	2,400	11,000	--	16	9,200	12,000 / 17,000
n-Propylbenzene	3,800	--	2,200	--	--	--	140J	290	24,000	19,000	--	0.99J	770	--	--	--	6,300	5,500 / 7,300
o-Xylene	20,000	12,000	16,000	9,700	72,000	9,900	2,400	1,500	150,000	88,000	2,600	4	4,000	9,900	210	9.7	28,000	25,000 / 33,000
Propene	27,000	95,000	37,000	160,000	200,000	160,000	16,000	12,000	140,000	170,000	21,000	1,500 D [6]	25,000	94,000	11,000	1,300	55,000	83,000 / 130,000
Styrene	1,200	--	--	--	--	--	--	--	13,000	8,600	--	--	250J	--	--	--	960J	1,900J / 2,500J
Tetrachloroethene	--	--	--	--	--	--	--	--	2,900J	--	--	1.5J	--	--	20J	2.8	--	--
Tetrahydrofuran (THF)	170,000	39,000	70,000	190,000	1,400,000	92,000	1,700	540	2,800,000	920,000	1,900	--	28,000	340,000	31J	170	300,000	430,000 / 610,000
Toluene	43,000	100,000	48,000	53,000	420,000	40,000	3,800	1,000	270,000	200,000	1,800	2.5	9,600	60,000	61J	20	53,000	79,000 / 110,000
Trichloroethene	--	--	--	--			--	--	--	--	--	--	--	--	--	--	580J	-- / 1,400J
Trichlorofluoromethane	--	--	--	--	--	--	72J	43J	--	--	--	6.8	--	--	--	2.8	--	--
Vinyl Acetate	--	--	--	--	--	--	--	--	--	7,600J	--	--	--	--	--	--	--	6,100J / --
Vinyl Chloride	--	--	--	--	--	--	--	130	--	--	--	200	--	--	26J	590	--	--
Volatile Organic Compounds (VOCs) – Method: EPA TO15 – Tentatively Identified Compounds [7]																		
(C12H26) Alkane: Straight-Chain (20.82)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5,300	--	--	--
(C12H26) Alkane: Straight-Chain (21.04)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4,300	--	--	--
1-Butene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	270	--	--
1-Chloro-1-Fluoroethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	210	--	--
1-Butanol	73,000	--	--	140,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Propanol (9.59)	--	--	--	--	--	--	--	--	--	3,200,000	--	--	--	79,000	--	--	--	230,000 / 290,000
2-Butanol (10.95)	--	--	--	--	440,000	--	--	--	14,000,000	4,700,000	--	--	11,000	100,000	--	--	40,000	240,000 / 320,000

Table 4 - Comprehensive Sampling Events 2012 Through 2015 - Bridgeton Landfill

Source Gas Comparison Table

Detected Compound Concentrations in Source Gas - All Units µg/m^3

Analyte	Sample Locations																	
	Amphitheater	Second Tier	East Face	Amphitheater	Second Tier	East Face	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry [1]	South Quarry	Flare Inlet (A / B) [2]
	August - 2012			April/May - 2013			July - 2014				January - 2015				July - 2015			
2-Ethyl cyclopentanone	41,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Ethylfuran	--	--	--	--	--	--	--	--	2,100,000	--	--	--	--	--	--	--	--	--
2-Methylbutane	--	--	--	--	--	--	--	--	--	--	--	400	--	--	--	930	--	--
2-Methylcyclopentanone	51,000	--	--	--	--	--	--	--	--	3,200,000	--	--	--	--	--	--	46,000	140,000 / 180,000
2-Methylfuran	68,000	380,000	240,000	--	--	--	--	--	13,000,000	7,200,000	8,200	--	66,000	390,000	--	--	250,000	330,000 / 480,000
2-Methylpentane	--	--	--	--	--	--	--	--	--	--	--	230	--	--	--	550	--	--
2-Methylpropene	--	--	--	--	--	--	--	--	--	--	24,000	1,000	29,000	95,000	11,000	1,300	85,000	-- / 110,000
2-Methyltetrahydrofuran	--	--	--	--	--	--	--	--	2,200,000	--	--	--	--	--	--	--	--	--
2-Methyl-2-butene				--	--	--	--	--	--	--	--	--	--	--	--	410	--	--
2-Pentanone	59,000	--	--	--	150,000	--	--	--	3,100,000	--	--	--	--	56,000	--	--	47,000	89,000 / 120,000
2,2-Dimethylbutane	--	--	--	--	--	--	--	--	--	--	--	270	--	--	--	390	--	--
3-Ethylcyclohexene	--	--	--	--	--	--	--	--	--	--	--	--	6,600	--	--	--	--	--
3-Ethyltoluene	--	--	--	--	--	--	--	2,600	--	--	--	--	--	--	--	--	--	--
3-Methyl-3-heptene	--	27,000	29,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylhexane	--	--	--	--	--	--	--	--	--	--	--	260	--	--	--	--	--	--
3-Methyl-Methylbutyrate	--	--	--	--	--	--	--	--	2,100,000	--	--	--	--	--	--	--	--	--
3-Methylpentane	--	--	--	--	--	--	--	--	--	--	--	160	--	--	--	290	--	--
4-Isopropyltoluene + 4-Methyldecane	--	--	--	--	--	--	--	--		--	3,400	--	--	--	--	--	--	--
Butyl Butanoate	--	--	--	--	--	--	--	--	--	2,800,000	--	--	--	--	--	--	--	--
C10-C12 Alkene (14.58 RT)	--	92,000	71,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C10-C12 Alkene (14.63 RT)	--	110,000	93,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C10H20 Compound (20.05)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,600	--	--	--
C11H24 Branched Alkane	--	--	--	--	--	--	--	3,100	--	--	--	--	--	--	--	--	--	--
C12H26 Branched Alkane	--	--	--	--	--	--	4,800	--	--	--	--	--	--	--	--	--	--	--
C12H26 Branched Alkane	--	--	--	--	--	--	--	2,300	--	--	--	--	--	--	--	--	--	--
C4H8 Alkene	--	--	--	--	--	--	14,000	7,600	--	--	--	--	--	--	--	--	--	--
C4H8 Alkene	--	--	--	--	--	--	9,800	5,700	--	--	--	--	--	--	--	--	--	--
C4H8 Alkene (4.92)	--	--	--	110,000	200,000	--	--	--	--	--	--	--	--	--	--	--	--	--
C4H8 Alkene (5.29)	--	--	--	--	--	98,000	--	--	--	--	--	--	--	--	--	--	--	--
C4H8 Alkene (5.53)	--	83,000	33,000	--	--	--	--	--	--	--	15,000	350	10,000	55,000	8,900	--	--	--
C4H8 Alkene (5.58)	--	--	--	100,000	140,000	84,000	--	--	--	--	--	--	--	--	--	--	--	--
C4H8 Alkene (5.81)	--	90,000	34,000	--	--	--	--	--	--	--	11,000	250	10,000	57,000	5,300	--	--	--
C5H10 Alkene (8.54)	--	--	--	--	--	--	5,200	--	--	--	--	--	--	--	3,400	--	--	--
C5H10 Compound	--	--	--	--	--	70,000	6,600	4,200	--	--	6,200	220	7,300	--	--	--	--	--
C6-C10 Alkene (13.0 RT)	--	110,000	74,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C6H12 Alkene (10.28)	--	--	--	--	--	--	--	--	--		2,800	--	--	--	2,500	--	--	--
C7H12 Compound	--	--	--	--	--	--	--	6,300	--	--	--	--	--	--	--	--	--	--
C7H12 Compound	--	--	--	--	--	--	15,000	5,500	--	--	--	--	--	--	--	--	--	--
C7H12 Compound	--	--	--	--	--	--	--	2,300	--	--	--	--	--	--	--	--	--	--
C7H12 Compound (13.71)	--	--	--	--	160,000	98,000	--	--	--	--	--	--	--	--	--	--	--	--
C7H12 Compound (13.75)	--	--	--	--	220,000	120,000	--	--	--	--	--	--	--	--	--	--	--	--
C8-C14 Alkene (16.89 RT)	--	--	31,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C8-C14 Alkene (16.96 RT)	--	22,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C8H14 Compound	--	--	--	--	--	--	5,400	--	--	--	--	--	--	--	--	--	--	--
C8H16 Alkene	--	--	--	--	--	--	6,500	--	--	--	--	--	--	--	2,500	--	--	--
C8H16 Compound	--	--	--	--	--	--	6,600	--	--	--	--	--	--	--	--	--	--	--

Table 4 - Comprehensive Sampling Events 2012 Through 2015 - Bridgeton Landfill Source Gas Comparison Table Detected Compound Concentrations in Source Gas - All Units µg/m^3																		
Analyte	Sample Locations																	
	Amphitheater	Second Tier	East Face	Amphitheater	Second Tier	East Face	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry [1]	South Quarry	Flare Inlet (A / B) [2]
	August - 2012			April/May - 2013			July - 2014				January - 2015				July - 2015			
C8H16 Compound	--	--	--	--	--	--	6,200	--	--	--	--	--	--	--	--	--	--	--
Camphene	--	--	--	--	--	--	7,000	--	--	--	4,700	--	--	--	--	--	--	--
Cyclopentene	--	41,000	33,000	--	--	90,000	6,400	3,700	--	--	6,500	--	13,000	--	2,300	--	50,000	--
decahydronaphthalene isomer	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,700	--	--	--
Dimethyl disulfide	70,000	--	42,000	100,000	--	100,000	--	--	2,200,000	3,100,000	--	--	11,000	120,000	--	--	94,000	150,000 / 310,000
Dimethyl Ether	--	120,000	--	130,000	210,000	130,000	--	--	--	--	4,100	--	15,000	140,000	--	--	100,000	-- / 180,000
Dimethyl Sulfide	68,000	83,000	280,000	710,000	2,000,000	1,300,000	--	--	17,000,000	20,000,000	44,000	--	90,000	1,300,000	--	--	570,000	1,200,000 / 1,700,000
Ethyl Butanoate	--	--	--	--	--	--	--	--	--	2,200,000	--	--	--	--	--	--	--	--
Ethyl butyrate	--	--	--	--	--	--	--	--	2,000,000	--	--	--	--	--	--	--	--	--
Furan	46,000	120,000	300,000	340,000	1,400,000	540,000	--	--	--	--	14,000	--	70,000	--	--	--	250,000	--
Hexamethylcyclotrisiloxane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexamethyldisiloxane	--	--	--	--	--	--	--	--	--	--	--	170	--	--	--	--	--	--
Isobutane	--	--	--	--	--	--	--	5,100	--	--	--	1,400	--	--	--	--	--	--
Isobutene	140,000	--	85,000	140,000	--	230,000	24,000	15,000	--	--	--	--	--	--	--	--	--	--
Isopentene	--	42,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl 3-Methylbutanoate	--	--	--	--	--	--	--	--	--	2,400,000	--	--	--	--	--	--	--	--
Methyl Acetate	44,000	--	--	400,000	280,000	--	--	--	6,800,000	10,000,000	--	--	--	--	--	--	--	--
Methyl Acetate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	69,000	520,000 / 750,000
Methyl Butanoate	--	--	--	--	--	--	--	--	--	15,000,000	--	--	--	--	--	--	--	--
Methyl Butyrate	110,000	--	--	370,000	540,000	--	--	--	14,000,000	--	--	--	11,000	530,000	--	--	140,000	630,000 / 870,000
Methyl hexanoate	43,000	--	--	--	--	--	--	--	--	4,200,000	--	--	--	--	--	--	--	130,000 / 170,000
Methyl isobutyrate	--	--	--	61,000	170,000	--	--	--	2,900,000	--	--	--	--	--	--	--	--	99,000 / 140,000
Methyl isovalerate	--	--	--	--	--	--	--	--	--	--	--	--	--	60,000	--	--	--	76,000 / --
Methyl Pentanoate	--	--	--	--	--	--	--	--	--	2,300,000	--	--	--	--	--	--	--	--
Methyl Propionate	45,000	--	--	220,000	230,000	57,000	--	--	8,500,000	8,000,000	--	--	--	380,000	--	--	62,000	420,000 / 600,000
Methyl valerate	--	--	--	55,000	--	190,000	--	--	--	--	--	--	--	55,000	--	--	--	79,000 / --
Methylcyclopentene Isomer	--	--	--	58,000	150,000	150,000	--	5,800	--	--	--	--	--	--	--	--	--	--
Methylfuran Isomer	--	--	--	190,000	890,000	400,000	--	--	--	--	--	--	--	--	--	--	--	--
n-Butane	--	41,000	35,000	--	--	--	15,000	8,000	--	--	12,000	950	--	--	11,000	3,100	--	--
n-Decane	40,000	--	--	--	--	--	--	--	2,300,000	--	--	--	6,500	--	--	--	46,000	--
n-Pentane	--	--	--	--	--	--	--	--	--	--	--	310	--	--	--	1,200	--	--
n-Undecane	46,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Isopropyltoluene	120,000	--	42,000	--	--	--	--	--	3,600,000	5,500,000	--	--	19,000	--	--	--	140,000	130,000 / 180,000
Propane	--	--	--	--	--	--	6,000	4,000	--	--	4,100	830	--	--	--	--	--	--
Trimethylsilanol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
unknown (19.89)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3,800	--	--	--
unknown (20.11)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
unknown (20.72)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,800	--	--	--
unknown	--	--	--	--	--	--	--	--	--	--	--	160	--	--	--	--	--	--
unknown	--	--	--	--	--	--	--	--	--	--	3,000	--	--	--	--	--	--	--
unknown (21.22)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,700	--	--	--
Unidentified Siloxane				--	--	--	--	--	--	--	--	52	--	--	--	--	--	--
Reduced Sulfur Compound – ASTM D5504																		
2-Ethylthiophene	--	--	840	290	2,500	760	--	--	--	2,600	--	--	--	--		--		
2,5-Dimethylthiophene	--	--	800	580	2,100	830	--	--	--	4,100	--	--	--	--		--		
3-Methylthiophene	840	330	900	1,600	8,400	3,300	340	120	3,800	4,600	--	--	--	--	--	--	840	--

Table 4 - Comprehensive Sampling Events 2012 Through 2015 - Bridgeton Landfill Source Gas Comparison Table Detected Compound Concentrations in Source Gas - All Units μg/m³																		
Analyte	Sample Locations																	
	Amphitheater	Second Tier	East Face	Amphitheater	Second Tier	East Face	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry [1]	South Quarry	Flare Inlet (A / B) [2]
	August - 2012			April/May - 2013			July - 2014				January - 2015				July - 2015			
Carbon Disulfide	190	180	2,300	170	250	38	28	25	1,200	1,600	--	--	--	--	24	--	450	--
Carbonyl Sulfide	--	150	150	--	190	--	--	--	1,300	1,100	--	--	--	--		--		
Dimethyl Disulfide	4,100	20,000	54,000	82,000	26,000	130,000	330	1,100	110,000	210,000	2,400	--	9,800	79,000	120	28	110,000	140,000 / 320,000
Dimethyl Sulfide	240,000	600,000	570,000	740,000	1,400,000	920,000	2,100	4,900	1,100,000	2,400,000	28,000	--	51,000	990,000	77	--	450,000	580,000 / 1,100,000
Ethyl Mercaptan	460	130	17	1,600	3,200	370	--	--	--	2,200	--	--	--	1,900		--		
Ethyl Methyl Sulfide	12,000	4,000	5,100	8,900	35,000	12,000	44	52	9,400	18,000	120	--	730	7,300	--	--	4,900	5,200 / 10,000
Hydrogen Sulfide	--	27	--	4,500	38,000	1,600	--	--	--	320	--	--	--	34,000		--		
Isobutyl Mercaptan	--	420	--	--	--	--	--	--	--	--	--	--	--	--		--		
Isopropyl Mercaptan	210	170	--	880	2,700	150	--	--	--	--	--	--	--	--		--		
Methyl Mercaptan	490	4,000	260	25,000	60,000	54,000	--	--	2,400	210,000	--	--	730	260,000	--	--	11,000	1,300 / 1,400
n-Butyl Mercaptan	2,100	710	1,400	2,600	13,000	3,400	--	--	2,800	5,200	--	--	300	3,100	--	--	1,800	--
n-Propyl Mercaptan	--	--	--	480	--	--	--	--	--	--	--	--	--	--		--		
tert-Butyl Mercaptan	380	29	--	220	1,200	--	--	--	--	--	--	--	--	--		--		
Tetrahydrothiophene	--	210	380	3,400	7,900	4,700	--	180	5,400	8,600	--	--	240	3,300	--	--	4,700	-- / 6,200
Thiophene	11,000	5,000	19,000	14,000	56,000	31,000	1,700	1,200	15,000	30,000	630	--	1,600	18,000	--	--	9,300	9,100 / 20,000
Total Sulfur – ASTM D 5504-12 [8]																		
Total Sulfur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	140	14	350,000	440,000 / 870,00
Fixed Gases – EPA 3Cm [9]																		
Hydrogen	--	--	--	4.43	18.8	5.73	--	--	22.3	12.4	--	--	0.872	9.81	--	--	2.08	8.61 / 9.77
Oxygen + Argon	--	--	--	11.1	0.114	0.175	3.67	3.52	2.62	5.14	3.26	7.63	18.6	9.46	1.09 J,B	1.12	14.8	10.4 / 8.99
Nitrogen	--	--	--	39.3	0.551	5.84	31.7	22.4	9.68	21.6	46.5	59	67.4	35.1	47.8	53.8	61.8	39.9 / 35.5
Methane	--	--	--	7.6	15.3	27.2	32	39.3	7.14	11.7	21.5	18.9	5.02	8.87	21.7	22	3.95	8.75 / 9.45
Carbon Monoxide	--	--	--	--	0.186	0.111	--	--	0.232	0.16	--	--	--	--	--	--	--	--
Carbon Dioxide	--	--	--	37.5	65	60.9	32.7	38	58	49	28.7	14.4	8.13	36.6	29.4	23.1	17.4	32.3 / 36.2
Polynuclear Aromatic Hydrocarbons - Method: EPA TO13a Modified																		
Naphthalene	35	7.9	13	220	30	120	5.1	--	300	NS [10]	18 D	0.19	230 D	NS	5.9 D,J	0.7 D,J	180 D,J	NS
Acenaphthene	4.5	0.23	0.22	35	0.18	5.4	0.074	--	0.95	NS	--	--	--	NS	--	--	4.5 D,J	NS
Phenanthrene	0.21	0.44	0.19	1	0.029	--	--	--	--	NS	--	--	--	NS	0.023	--	--	NS
Anthracene	0.19	0.022	0.041	--	--	--	--	--	--	NS	--	--	--	NS	--	--	--	NS
Fluoranthene	--	0.019	0.026	--	--	--	--	--	--	NS	--	--	--	NS	--	--	--	NS
Fluorene	3.4	0.2	0.18	12	0.051	1.3	--	--	0.16	NS	--	--	--	NS	--	--	--	NS
Pyrene	--	0.021	0.016	--	--	--	--	--	--	NS	--	--	--	NS	--	--	--	NS
Polychlorinated Dibenzo-p-Dioxins, Dibenzofurans – EPA Method TO-9A																		
2,3,7,8-TCDD	1.52E-08	1.03E-08	3.00E-08	8.68E-08	1.49E-07	1.05E-07	--	5.13E-11	3.36E-11	NS	0	0	0	NS	1.38E-09	0.00E+00	8.71E-10	NS
Amine Compounds – AQL 101																		
Diisopropylamine	--	--	--	--	5,700	--	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylamine	--	--	--	2,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--
sec-Butylamine	--	--	--	2,700	6,200	2,100	--	--	--	--	--	--	--	--	--	--	--	--
Trimethylamine	--	--	--	--	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur Dioxide - Method: OSHA ID 200																		
Sulfur Dioxide	NS	NS	NS	2,600	9,100	1,600	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Hydrochloric Acid – NIOSH 7903																		
Hydrogen Chloride	NS	NS	NS	1,100	1,100	1,600	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

1. North Quarry source gas VOC, Reduced Sulfurs, and Fixed Gases sample was collected on 10/8/2015 due to failed sample collection during the July 2015 event.
2. Two samples were collected sequentially at the Flare Inlet and distinguished as Flare A and Flare B.

Table 4 - Comprehensive Sampling Events 2012 Through 2015 - Bridgeton Landfill
Source Gas Comparison Table
Detected Compound Concentrations in Source Gas - All Units µg/m³

Analyte	Sample Locations																	
	Amphitheater	Second Tier	East Face	Amphitheater	Second Tier	East Face	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry	South Quarry	Flare Inlet	Neck	North Quarry [1]	South Quarry	Flare Inlet (A / B) [2]
	August - 2012			April/May - 2013			July - 2014				January - 2015				July - 2015			

3. "--" = Compound not detected
4. J = The result is an estimated concentration that is less than the Method Reporting Limit (MRL) but greater than or equal to the Method Detection Limit (MDL).
5. B = Analyte detected in both the sample and associated method blank.
6. D = The reported result is from a dilution
7. Tentatively Identified Compounds – under Method: EPA TO15 + TICs. The reported concentrations for TICs are estimated. Retention time is located in parentheses next to Unknown compounds and identical compounds with different retention times.
8. A laboratory analysis for total sulfur (ASTM D 5504-12) was not conducted prior to the July 2015 event.
9. Units for fixed gases are volume analyte/volume of air %.
10. "NS" = Not Sampled

Table 5. Daily Monitoring Path Hydrogen Sulfide Detections (ppm) by Jerome H2S Analyzer							
2013							
Location	**N**	**Number of Detects**	**Frequency of Detection**	**Minimum**	**Maximum**	**Mean**	**Median**
12755 St Charles Rock Rd	380	271	71.3%	0	0.01	0.0035	0.003875
3715 Pennridge	375	254	67.7%	0	0.01	0.0032	0.00357
AAA Trucking	378	253	66.9%	0	0.01	0.0032	0.00369
Eise Park	376	229	60.9%	0	0.00969	0.0028	0.00329
Forshaw	379	258	68.1%	0	0.01	0.0034	0.00388
Jimmy John's	379	254	67.0%	0	0.0426	0.0033	0.00363
Judgemental Sample	652	494	75.8%	0	0.04546	0.0039	0.00428
MDNR Trailer	380	254	66.8%	0	0.0091	0.0033	0.003765
Materialogic	382	266	69.6%	0	0.02559	0.0035	0.00391
Metro Paving	382	263	68.8%	0	0.01	0.0034	0.00391
NW Autobody	391	267	68.3%	0	0.01	0.0034	0.00393
Ram's Area	378	257	68.0%	0	0.01067	0.0033	0.00382
Turner Farm	162	139	85.8%	0	0.0408	0.0046	0.004595
Total	4994	3459	69.3%	0	0.04546	0.0034	0.0039
2014							
Location	**N**	**Detects**	**Frequency of Detection**	**Minimum**	**Maximum**	**Mean**	**Median**
12755 St Charles Rock Rd	689	351	50.9%	0	0.01	0.0020	0.00302
3715 Pennridge	624	282	45.2%	0	0.01	0.0017	0
AAA Trucking	694	292	42.1%	0	0.0643	0.0017	0
Eise Park	680	296	43.5%	0	0.0388	0.0017	0
Forshaw	716	338	47.2%	0	0.01	0.0018	0
Jimmy John's	696	307	44.1%	0	0.01	0.0017	0
Judgemental Sample	1566	670	42.8%	0	0.02333	0.0017	0
MDNR Trailer	696	297	42.7%	0	0.01	0.0016	0
Materialogic	725	345	47.6%	0	0.01	0.0018	0
Metro Paving	693	312	45.0%	0	0.01	0.0017	0
NW Autobody	707	308	43.6%	0	0.01	0.0017	0
Ram's Area	694	325	46.8%	0	0.01	0.0018	0
Turner Farm	--	--	--	--	--	--	--
Total	9180	4123	44.9%	0	0.0643	0.0017	0
2015							
Location	**N**	**Number of Detects**	**Frequency of Detection**	**Minimum**	**Maximum**	**Mean**	**Median**
12755 St Charles Rock Rd	283	110	38.9%	0	0.00556	0.0015	0
3715 Pennridge	281	104	37.0%	0	0.00676	0.0014	0
AAA Trucking	282	83	29.4%	0	0.0053	0.0011	0
Eise Park	287	86	30.0%	0	0.006	0.0011	0
Forshaw	286	95	33.2%	0	0.00586	0.0013	0
Jimmy John's	284	95	33.5%	0	0.00544	0.0012	0
Judgemental Sample	670	233	34.8%	0	0.00636	0.0013	0
MDNR Trailer	285	91	31.9%	0	0.00582	0.0012	0
Materialogic	285	88	30.9%	0	0.00594	0.0012	0
Metro Paving	282	87	30.9%	0	0.00847	0.0012	0
NW Autobody	286	99	34.6%	0	0.00644	0.0013	0
Ram's Area	282	93	33.0%	0	0.0053	0.0012	0
Turner Farm	--	--	--	--	--	--	--
Total	3793	1264	33.3%	0	0.00847	0.0013	0

Table 6. Daily AreaRAE Summary of Sulfur Dioxide

Sulfur Dioxide Concentrations (ppm)						
Location and Unit	2013					
	N	Number of Detects	Frequency of Detection	Range of Maximum Detected Concentrations	Range of Hourly Average Concentrations	Range of Daily Average Concentrations
MSD Lift Station (7)	6,576	2,145	32.6%	0.1 - 0.4	0.000079 - 0.225	0.00000803 - 0.149031
Terrisan Ct (8)	6,942	1,108	16.0%	0.1 - 3.0	0.001639 - 0.107143	0.0000695 - 0.041021
Taussig Avenue (13)	6,919	278	4.0%	0.1 - 0.8	0.001667 - 0.049153	0.00006946 - 0.015827
Total	20,437	3,531	17.3%	0.1 - 5.0	0.000079 - 0.225	0.00000803 - 0.149031
Location and Unit	2014					
	N	Number of Detects	Frequency of Detection	Range of Maximum Detected Concentrations	Range of Hourly Average Concentrations	Range of Daily Average Concentrations
MSD Lift Station (7)	6,223	757	12.2%	0.1 - 0.3	0.0023 - 0.1108	0.0001 - 0.04910833
Terrisan Ct (8)	8,382	493	5.9%	0.1 - 1.6	0.0013 - 0.1237	0.0000958 - 0.035404
Taussig Avenue (13)	8,378	176	2.1%	0.1 - 0.1	0.0017 - 0.0955	0.0000739 - 0.010789
Total	22,983	1,426	6.2%	0.1 - 1.6	0.0013 - 0.1237	0.0000739 - 0.04910833
Location and Unit	2015					
	N	Number of Detects	Frequency of Detection	Range of Maximum Detected Concentrations	Range of Hourly Average Concentrations	Range of Daily Average Concentrations
Unit 5	170	4	2.4%	0.1 - 0.1	0.0026 - 0.0027	0.0001083 - 0.0003292
Terrisan Ct (8)	5,392	412	7.6%	0.1 - 0.3	0.0022 - 0.0282	0.0000958 - 0.011242
Taussig Avenue (13)	5,430	91	1.7%	0.1 - 0.5	0.0023 - 0.0171	0.0001042 - 0.002238
Total	10,992	507	4.6%	0.1 - 0.5	0.0022 - 0.0282	0.00009583 - 0.011242

NOTES:

1. National Ambient Air Quality Standard (NAAQS) for Sulfur Dioxide (June 22, 2010)
   Averaging Time
   Primary 1-hr average 0.075 ppm
   Secondary 3-hr average 0.500 ppm
2. Units 8 and 13 were relocated in December 2013 to Terrisan Ct. and Taussig Avenue (Figure 11B). Previous locations of Units 8 and 13 are detailed in Figure 11A.
3. Monitoring dates: Unit 7 - 2/28/13 - 10/1/14, Unit 8 - 2/28/13 - 8/24/15, Unit 13 3/1/2013 - 8/24/2015, Unit 5 - 8/17/15 - 8/24/2015

Table 7. Daily AreaRAE Summary of Hydrogen Sulfide

Hydrogen Sulfide Concentrations (ppm)

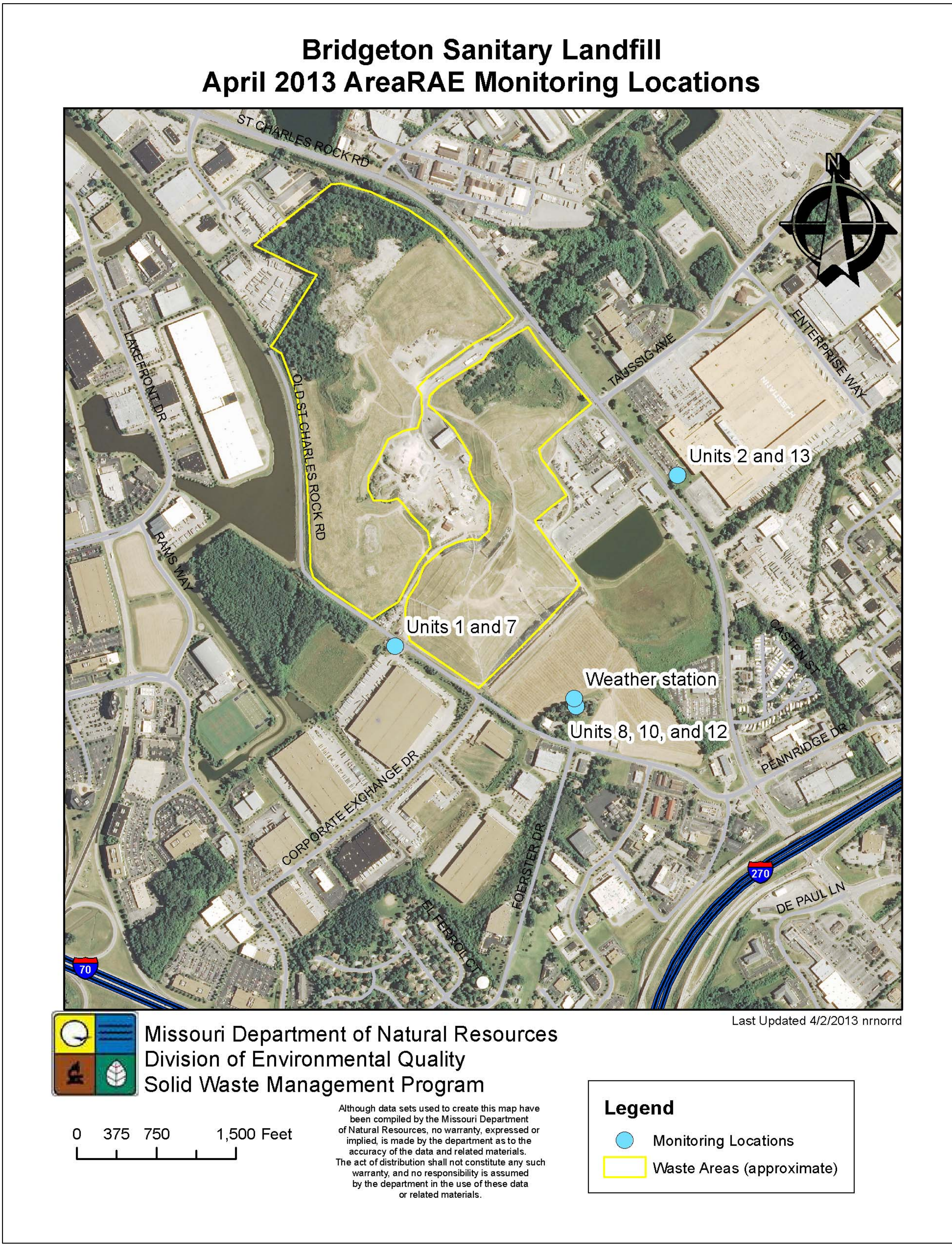
Location and Unit	N	Number of Detects	Frequency of Detection	Range of Maximum Detected Concentrations	Range of Hourly Average Concentrations	Range of Daily Average Concentrations
2013						
MSD Lift Station (1)	6,656	1,524	22.9%	0.1 - 3.7	0.0022727 - 3.367568	0.0000969 - 0.523243
Taussig Avenue (2)	6,660	2,208	33.2%	0.1 - 3.3	0.0016667 - 3.3	0.0001042 - 1.811512
Terrisan Ct (10)	6,688	1,889	28.2%	0.1 - 1.4	0.0016667 - 0.9945946	0.0000694 - 0.72704
Taussig Avenue (13)	253	1	0.4%	0.1 - 0.1	0.0002174 - 0.0002174	0.0000155 - 0.0000155
Total	20,257	5,622	27.8%	0.1 - 3.7	0.0002174 - 3.367568	0.0000155 - 1.811512
2014						
Location and Unit	**N**	**Number of Detects**	**Frequency of Detection**	**Range of Maximum Detected Concentrations**	**Range of Hourly Average Concentrations**	**Range of Daily Average Concentrations**
MSD Lift Station (1)	7,658	1,135	14.8%	0.1 - 0.6	0.001176 - 0.371429	0.000049 - 0.1284733
Taussig Avenue (2)	8,070	2,572	31.9%	0.1 - 1.6	0.002041 - 0.815385	0.0000887 - 0.2064295
Terrisan Ct (10)	8,305	688	8.3%	0.1 - 0.6	0.001282 - 0.213889	0.0001016 - 0.0544304
Total	24,033	4,395	18.3%	0.1 - 1.6	0.001176 - 0.815385	0.000049 - 0.2064295
2015						
Location and Unit	**N**	**Number of Detects**	**Frequency of Detection**	**Range of Maximum Detected Concentrations**	**Range of Hourly Average Concentrations**	**Range of Daily Average Concentrations**
MSD Lift Station (1)	5,234	400	7.6%	0.1 - 0.2	0.00125 - 0.1	0.0001033 - 0.018895
Taussig Avenue (2)	5,184	749	14.4%	0.1 - 0.4	0.002273 - 0.181081	0.0000947 - 0.0548417
Terrisan Ct (10)	5,251	505	9.6%	0.1 - 0.2	0.002381 - 0.055814	0.0001016 - 0.01615
Total	15,669	1,654	10.6%	0.1 - 0.4	0.00125 - 0.181081	0.0000947 - 0.0548417

NOTES:

1. Units 2, 10, and 13, were relocated in December 2013 to Taussig Ave., Terrisan Ct., and Taussig Ave. (Figure 11B). Previous locations of units are detailed in Figure 11A.
2. Monitoring Dates: Units 1, 2, 10 - 3/7/2013 - 8/24/2015, and Unit 13 - 3/1/2013 - 3/15/2013.

FIGURES

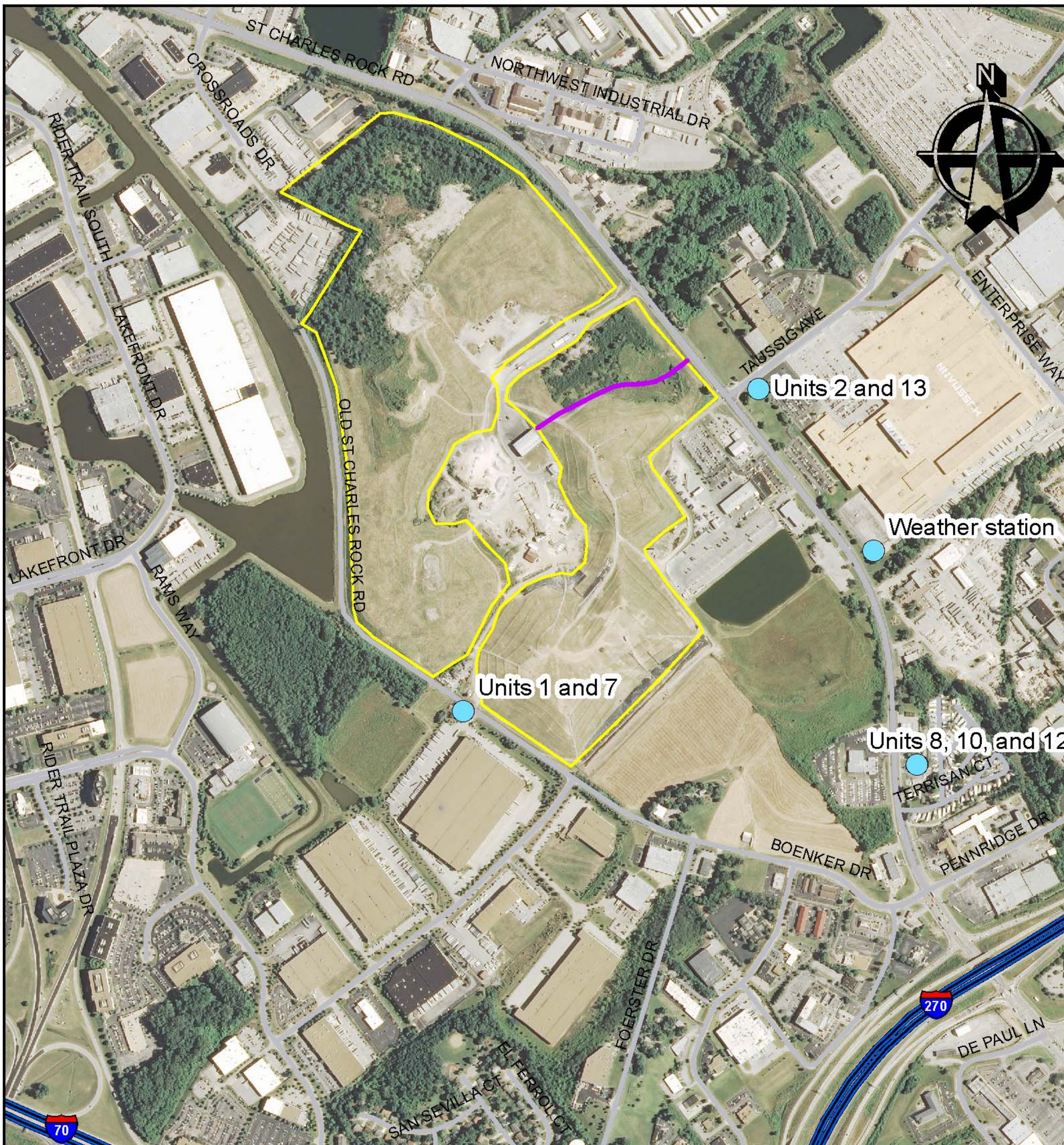
Figure 1A. MDNR AeraRAE® Monitoring Locations (April 2, 2013)



http://dnr.mo.gov/env/swmp/bridgeton/arearaemonitormap040113.pdf

Figure 1B. MDNR AeraRAE® Monitoring Locations (December 23, 2013 through October 2015)

Bridgeton Sanitary Landfill
Real-time Monitoring Equipment (updated 12/23/13)



Last Updated 12/23/2013 nrnorrd

Missouri Department of Natural Resources
Division of Environmental Quality
Solid Waste Management Program

0 375 750 1,500 Feet

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Legend

- AreaRAE Monitoring Locations 12-23-13
- 8-2013 Conceptual Trench Location
- Waste Areas (approximate)

http://dnr.mo.gov/bridgeton/docs/areraemonitoringlocations.pdf